



Center for Research in Educational Policy

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Freedom to Learn Program

Michigan 2005-2006 Evaluation Report

Prepared for Freedom to Learn and the One-to-One Institute





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EXECUTIVE SUMMARY

Introduction

This report summarizes the 2005-2006 evaluation results of the Michigan Freedom to Learn (FTL) program. The major goal of the FTL program is to improve student learning and achievement in Michigan schools through the integration of 21st Century technology tools with teaching and learning in K-12 classrooms. A key component of FTL was a rigorous and comprehensive evaluation study designed to gauge the impacts of the program relative to its primary goals.

Goals

The FTL Program goals are listed below. The evaluation was structured to assess the degree to which each program goal was achieved.

- GOAL 1 Enhance student learning and achievement in core academic subjects with an emphasis on developing the knowledge and skills requisite to the establishment of a 21st Century workforce in Michigan.
- GOAL 2 Provide greater access to equal educational opportunities statewide through ubiquitous access to technology.
- GOAL 3 Foster effective use of the wireless technology through systematic professional development for teachers, administrators and staff.
- GOAL 4 Empower parents and caregivers with the tools to become more involved in their children's education.
- GOAL 5 Support innovative structural changes in participating schools and sharing of best practices through the creation of human networks among Program participants.

Participants

The FTL program was implemented in 195 Michigan schools during 2005-2006. FTL students (5,770), teachers (380), Lead Teachers (75), and parents/caregivers of FTL students (1,241) completed 7,466 surveys. A total of 485 hours of direct classroom observations were conducted in 826 FTL classrooms.

Design

This study used a global descriptive design that employed a mixed-methods approach (Johnson & Onwuegbuzie, 2004) that utilized a number of validated data collection instruments.

Measures

Direct Classroom Observation Measures

- School Observation Measure (SOM[®]): Measures usage of 24 instructional strategies.
- Survey of Computer Use (SCU[®]): Measures student use of technology and software.
- Rubric for Student-Centered Activities (RSCA[®]): Measures the frequency, strength of application, and use of technology to support seven student-centered activities.

FTL Program Evaluation Surveys

- FTL Student Survey: Collects student impressions regarding impact of laptop use on learning, enjoyment of using laptops, subject areas of laptop work, and most commonly used software.
- FTL-Teacher Technology Questionnaire (FTL-TTQ[®]): Collects teacher agreement regarding: impact of laptop use on students and instruction, teacher readiness to integrate student use of laptops, support for the laptop program, and Lead Teacher effectiveness.

- FTL Lead Teacher Survey (FTL-LT): Collects Lead Teacher perceptions of teacher, parent and administrator support and participation and overall impact of FTL on students.
- FTL Parent Surveys: Collects parents' impressions regarding student use and enjoyment of using laptops and participation in school sponsored laptop programs.

Student Performance-Based Assessment

A Problem-Solving Task and Technology Task were administered to 6th grade students to examine the impact of FTL on student ability to solve problems and to generate computer products that reflect problem-solving solutions.

Student Academic Achievement

The English, math, reading and writing Michigan Educational Assessment Program (MEAP) scores of 7th grade students enrolled in FTL schools considered to be implementing the program effectively were compared to achievement outcomes of 7th grade students in comparable schools using a series of 2x2 chi-square frequency analyses.

Procedures

Multi-class (3-hour visit involving 15-minute observations in 10 classrooms per school) and targeted (prearranged one-hour session) observations were conducted during late spring 2006. The FTL surveys and performance-based assessments were also administered during late spring 2006.

Results

Direct Classroom Observation Results

Multi-Class Observations. Data from unannounced, random visits to 599 FTL classrooms revealed that teachers used both traditional and student-centered strategies. The most highly significant difference favoring FTL over national norms was student use of the laptops as a learning tool ($ES = +1.07$). Also noteworthy were the significant differences in FTL teacher use of independent inquiry, project-based learning, meaningful laptop lessons, and higher quality hands-on activities. The data also revealed that the FTL students used the Internet, word processing, and presentation software significantly more than students represented by the national norm.

Targeted Observations. Data from 227 targeted visits to FTL classrooms also revealed highly significant differences favoring FTL over national norm students for use of laptops as a learning tool ($ES = +1.42$) and for instructional delivery. FTL students used the following software significantly more than students using computers in classes represented by the norm: Internet browsers; word processing; CD references; presentation; and spreadsheets. But even more importantly, FTL students were more frequently engaged in meaningful computer activities, independent research, and project-based learning in classes with teachers acting as a facilitator.

Survey Results

Student Survey. Overall, responses from 5,770 FTL students were very positive with regard to using laptops at school. In particular, almost all of the students liked using the laptops and wanted to use them again next year. There was also agreement that use of the laptops had improved their Internet research skills, made it easier to do school work, made them more interested in learning, and would help them get better jobs in the future. Fewer students agreed that laptops made them want to get better grades, helped them to remember more and do better on tests, or improved their writing.

Teacher Survey. The FTL-TTQ was completed by total of 380 FTL teachers from 77 schools. When comparing the FTL results with the national norms, FTL teacher responses were significantly more positive on four of the five TTQ categories: Impact on Classroom Instruction; Impact on Students; Teacher Readiness to Integrate Technology; and Technical Support. Strikingly, the FTL teachers showed significantly greater confidence that they knew how to *meaningfully* integrate laptop use into lessons, align use of the laptops with curriculum standards, and had adequate computer skills to conduct lessons with students using laptops. FTL Teachers were in

general agreement that Lead Teachers had been a valuable asset to their school's FTL program. There was moderate agreement that the teachers had frequently participated in professional development (PD) provided by their Lead Teacher and that the PD had helped them to improve integration lessons.

Lead Teacher Survey. Most of the 75 FTL Lead Teachers from 63 schools agreed that the FTL program had a positive impact on students' ability and comfort level with technology and that use of the laptops had increased student motivation to learn, teacher use of student-centered activities, and student-to-teacher interactions. Lead Teachers also agreed that FTL-provided professional development had been effective, with nearly 60% indicating that they provided teacher training to the FTL teachers in their school. Fewer agreed that administrators participated in FTL training or that the community/parents were involved in the FTL program.

Parent Survey. A total of 1,241 parents/guardians of FTL students in 90 schools completed the paper-based survey. Overall, parent responses were positive and reflected general agreement that using laptop computers had improved their child's research skills and had increased their child's interest and achievement in school. There was slightly less overall agreement that using laptops had improved their child's writing skills. Less than 20% of the parents had participated in FTL-sponsored activities.

Student Performance-Based Assessment

Across all problem-solving areas, the FTL means scores were higher or equal to those of the control group. FTL program students exhibited significantly higher ability in demonstrating understanding of the problem and in identifying what needs to be known to solve the problem. The Technology Task analyses showed highly significant advantages for the FTL Program students with regard to completing Presentation and Internet tasks.

Student Academic Achievement

School-level student English, math, reading and writing MEAP scores were compared using a series of 2x2 chi-square frequency analyses. The student outcomes for one pair of schools were not significantly different. Among the remaining seven pairs, four FTL schools outperformed their matched comparison schools in math and writing, while three comparison schools outperformed the FTL schools in math, English, and writing.

Conclusions

The conclusions of the present study are presented in association with each of the FTL program goals in the following section.

GOAL 1. Enhance student learning and achievement in core academic subjects with an emphasis on developing the knowledge and skills requisite to the establishment of a 21st Century workforce in Michigan.

The results suggest that FTL students have greater advantages than non-FTL students with regard to developing the knowledge and skills needed to achieve success in the 21st Century workforce and equal to or enhanced advantages for increased learning and achievement. FTL students as compared to control students exhibited significantly greater ability to locate and utilize Internet resources, develop computer-based presentations and solve problems. The FTL students indicated that they were more interested in learning and felt they would get better jobs in the future as a result of using the laptops. Similarly, the FTL teachers agreed to a significantly higher degree than did teachers represented by the national norms that computer use had a positive impact student learning and achievement. Additionally, observations showed that FTL students were engaged in meaningful computer learning activities significantly more than students represented in the national norms.

GOAL 2. Provide greater access to equal educational opportunities statewide through ubiquitous access to technology.

FTL, as documented in this evaluation report, has made significant strides toward providing greater access to equal educational opportunities to students in FTL classrooms. This is evidenced by the program providing laptop computers to students in 195 schools and by data from over 5,700 FTL

students who reported that they are very glad that they get to use laptop computers and want to use them again next year. Nearly all students reported that using laptop computers increased their research skills, made schoolwork easier and made them learn more and do better on tests. Similarly, the FTL teachers reported that having laptops had increased their use of student-centered practices, increased student motivation and learning, and improved student computer skills as well as their own personal technology skills. FTL vs. national norm classroom observation data show that computer activities in FTL lessons were significantly more meaningful and that FTL students more frequently used the laptops as learning tools. Collectively, these data present triangulated evidence that FTL provided greater access to equal educational opportunities in Michigan through ubiquitous access to technology.

GOAL 3. Foster effective use of the wireless technology through systematic professional development (PD) for teachers, administrators and staff.

There was moderate agreement among the 380 FTL teachers that they had received adequate training to integrate laptops into their instruction, that the quality of laptop lessons was improved as a result of the FTL PD, and that they more frequently integrated laptops into their instruction. Evidence of PD effectiveness was seen during classroom observations in which FTL teachers implemented lessons that were significantly more meaningful, more student-centered, and more often used laptops as tools for learning than did teachers represented by national norms. The results suggest that the PD focus and approach for preparing teachers to integrate effective use of laptops is successful. However, the moderate responses from teachers suggest that the frequency and amount of professional development needs to be increased. Regarding administrators, Lead Teachers from 63 schools reported less administrator participation in FTL PD during 2005-2006 although many administrators modeled the use of technology and were involved in the FTL program.

GOAL 4. Empower parents and caregivers with the tools to become more involved in their children's education.

Direct information from over 1,200 parents/caregivers representing approximately half of the FTL schools revealed that parents were supportive of their children using laptops at school. Almost all parents agreed that laptop use had improved their child's research skills and increased their interest and achievement in school. However, very few of the parents reported participation in FTL-sponsored computer training. Similar results are seen in survey responses from FTL teachers and Lead Teachers who generally agreed that parents supported the FTL program, while parental involvement with FTL was minimal.

GOAL 5 Support innovative structural changes in participating schools and sharing of best practices through the creation of human networks among Program participants.

Data from this evaluation reveal that the FTL program enabled and supported participating schools to achieve significantly more innovative structural changes during 2005-2006 than schools represented in the national norms. This was evidenced by observing significantly more student-centered activities that engaged students in independent research through the use of laptops as tools. It was also evidenced in FTL students demonstrating significantly higher problem solving, Internet and presentation software ability than matched-control students. Additional evidence is seen in FTL teachers being significantly more confident about meaningfully integrating technology than national norm teachers. Collectively, data from observations, surveys, performance-based assessments, and achievement analyses suggest that the two-year FTL program has been a catalyst for innovative technology interventions that have improved educational opportunities for Michigan's students, while the data also reveal room for continued growth and improvement.

MICHIGAN FREEDOM TO LEARN

2004-2005 EVALUATION REPORT

This report summarizes the 2005-2006 evaluation results of the Michigan Freedom to Learn (FTL) program. The purpose of the evaluation was threefold: (a) to use rigorous research to assess the effects of FTL in raising student achievement as a function of students becoming more proficient and engaged in using technology as a tool for learning, (b) to provide formative evaluation data to the participant schools to serve as a basis for improvement planning and as documentation of their accomplishments to demonstrate progress; and (c) to provide cumulative evidence of the implementation progress and outcomes of the participant schools.

The major goal of the FTL program is to improve student learning and achievement in Michigan schools through the integration of 21st Century technology tools with teaching and learning in K-12 classrooms. A key component of FTL was to obtain valid data from a rigorous and comprehensive evaluation study to gauge the impacts of the program relative to its primary goals. This year's evaluation involved 195 schools that were awarded Freedom to Learn grants. The primary intervention of the program consisted of providing laptop computers for students in participating schools. In addition, FTL teachers, Lead Teachers, and administrators were provided with extensive professional development opportunities.

RESEARCH GOALS

The FTL Program goals are listed below. The evaluation was structured to examine the degree to which each program goal was achieved.

- GOAL 1 Enhance student learning and achievement in core academic subjects with an emphasis on developing the knowledge and skills requisite to the establishment of a 21st Century workforce in Michigan.*
- GOAL 2 Provide greater access to equal educational opportunities statewide through ubiquitous access to technology.*
- GOAL 3 Foster effective use of the wireless technology through systematic professional development for teachers, administrators and staff.*

GOAL 4 *Empower parents and caregivers with the tools to become more involved in their children's education.*

GOAL 5 *Support innovative structural changes in participating schools and sharing of best practices through the creation of human networks among Program participants.*

PARTICIPANTS

A total of 195 schools received Freedom to Learn grants for the 2005-2006 school year. The schools represented both private and public districts from across the entire state. In addition, the participant schools included those from rural Michigan as well as all major metropolitan areas.

Although the participating schools included elementary, middle and high schools, initial implementation primarily occurred at the 6th grade level.

Approximately 46% (90 of 195) of the schools participated in one or more aspects of the FTL program evaluation. Specifically, 380 FTL teachers and 5,770 students from 76 schools and Lead Teachers at 63 schools completed online FTL surveys, while 1,241 parents/caregivers of FTL students from 90 schools completed paper-based surveys. Direct classroom observations were conducted in 826 FTL classrooms.

DESIGN

A global descriptive design was used for the evaluation. This design employed a mixed-methods approach (Johnson & Onwuegbuzie, 2004) to examine the processes and products that resulted from students using laptops to improve learning. Validated survey and observation instruments, student performance-based assessments, and student level *Michigan Educational Assessment Program (MEAP)* scores served as the critical data sources in the comprehensive evaluation model. Details of the instrumentation and administration procedures are listed below.

MEASURES AND PROCEDURES

Four measurement strategies were used to collect the evaluation data: direct classroom observations, surveys, student problem solving and computer skills assessments, and student academic performance.

Direct Classroom Observation Measures

Lead Teachers and independent external researchers completed extensive training to conduct both multi-class and targeted classroom observations of FTL classrooms. The training prepared them to collect frequency data regarding observed instructional practices with three data collection instruments: the School Observation Measure (SOM[®]), the Survey of Computer Use (SCU[®]) and the Rubric for Student-Centered Activities (RSCA[®]). The RSCA was only used for multi-class observations. The SOM was used to collect data regarding overall classroom activities; the SCU was used to assess student use of computers, while the RSCA was used to measure the strength of application and use of technology to support student-centered activities. The classroom observation instruments are described below.

SOM. The SOM was developed to determine the extent to which different common and alternative teaching practices are used throughout an entire school (Ross, Smith, & Alberg, 1999). The standard or *multi-class SOM* procedure involves observers' visiting 10-12 randomly selected classrooms, for 15 minutes each, during a three-hour visitation period. The procedure used for the current study involved randomly visiting all FTL classrooms in schools with 3 or more FTL classes. The observer examined classroom events and activities descriptively, not judgmentally. Notes were taken relative to the use or nonuse of 24 target strategies. The notes form also contained two global items that use a three-point scale (low, moderate, high) to rate, respectively, the use of academically focused instructional time and degree of student attention and interest. At the conclusion of the three-hour visit, the observer summarized the frequency with which each of the 24 strategies was observed across all classes in general on a data summary form. The frequency was recorded via a 5-point rubric that ranges from (0) Not observed to (4) Extensively. The same 5-point scale was used to summarize how frequently *high* academically focused class time and *high* student interest/attention were observed.

Targeted observations were conducted to examine classroom instruction during prearranged 45- to 60-minute sessions in which randomly selected FTL teachers implemented a prepared lesson that integrated the use of laptops. Notes forms were completed every 15 minutes of the lesson and were then summarized on a SOM Data Summary Form.

To ensure the reliability of data, observers received a manual providing definitions of terms, examples and explanations of the target strategies, and a description of procedures for completing the instrument. The target strategies include traditional practices (e.g., direct instruction and independent seatwork) and alternative, predominately student-centered methods associated with educational reforms (e.g., cooperative learning, project-based learning, inquiry, discussion, using technology as a learning tool). The strategies were identified through surveys and discussions involving policy makers, researchers, administrators, and teachers, as those most useful in providing indicators of schools' instructional philosophies and implementations of commonly used reform designs (Ross, Smith, Alberg, & Lowther, 2001).

After receiving the manual and instruction in a group session, each observer participated in sufficient classroom-based practice exercises to ensure that his/her data were comparable with those of experienced observers. In a 2004 reliability study reported by Sterbinsky, Ross and Burk, observer ratings were within one category for 96% of the multi-class observations and for 91% of the targeted observations.

SCU. A companion instrument to SOM is the Survey of Computer Use (SCU) (Lowther & Ross, 2001). The SCU was completed as part of the SOM observation sessions, during which SCU data were also recorded in 15-minute intervals and then summarized on an overall data form.

The SCU was designed to capture exclusively *student* access to, ability with, and use of computers rather than teacher use of technology by recording four types of data: (a) computer capacity and currency, (b) configuration, (c) student computer ability and (d) student activities while using computers. Computer capacity and currency is defined as the age and type of computers available for student use and whether or not Internet access was available. Configuration refers to the number of students working at each computer (e.g., alone, in pairs, in small groups). Student computer ability was assessed by recording the number of students who were computer literate (i.e., easily used software features/menus) and the number of students who easily used the keyboard.

The next section of the SCU focuses on student use of computers with regard to: the types of activities, the subject areas of activities, and the software being used. The computer activities are divided into four categories based on the type of software tool: production tools, Internet/research

tools, educational software, and testing software. Within each category, primary types of software are identified. For example, under Production Tools, the software includes: word processing, databases, spreadsheets, draw/paint/graphics, presentation (e.g., PowerPoint®), authoring (e.g., KidPix®), concept mapping (e.g., Inspiration), and planning (MS Project®). For the Internet/Research Tools, three types of software are included: Internet browser, CD reference materials, and communications (e.g., email, listservs, and chat rooms). The Educational Software also has three types of software: drill/practice/tutorial, problem-solving (e.g., Riverdeep™) and process tools (e.g., Author's Toolkit™). Testing Software has individualized/tracked (Accelerated Reader™) and generic types. With this type of recording system, several activities can be noted during the observation of one student working on a computer. For example, if a student gathered data from the Internet, created a graph from the data, and then imported the graph into a PowerPoint presentation, the observer would record three types of software tools as being observed: Internet browser, spreadsheet, and presentation.

This section of the SCU ends by identifying the subject area of each computer activity. The categories include: language arts, mathematics, science, social studies, other, and none. The computer activities and software being used are summarized and recorded using a five-point rubric that ranges from (0) Not Observed to (4) Extensively observed. The final section of the SCU is an "Overall Rubric" designed to assess the degree to which the activity reflects "meaningful use" of computers as a *tool* to enhance learning. The rubric has four levels: 1 – Low-level use of computers, 2 – Somewhat meaningful, 3 – Meaningful, and 4 - Very meaningful. Reliability data for the SCU (Sterbinsky & Burke, 2004) show that observer ratings were within one category for 97% of the multi-class observations and for 91% of the targeted observations.

RSCA. The Rubric for Student-Centered Activities was developed by CREP (Lowther, Ross, & Plants, 2000) as an extension to SOM and SCU. The RSCA was used by observers to more closely evaluate the degree of learner engagement in seven selected areas considered fundamental to the goals of increasing student-centered learning activities (cooperative learning, project-based learning, higher-level questioning, experiential/hands-on learning, student independent inquiry/research, student discussion, and students as producers of knowledge using technology). These strategies reflect emphasis on higher-order learning and attainment of deep understanding of

content and whether or not technology was utilized as a component of the strategy. Such learning outcomes seem consistent with those likely to be engendered by well-designed, real-world linked exercises, projects, or problems utilizing technology as a learning tool. Each item includes a two-part rating scale. The first is a four-point scale, with 1 indicating a very low level of application, and 4 representing a high level of application. The second is a Yes/No option to the question: "Was technology used?" with space provided to write a brief description of the technology use. The RSCA was completed as part of SOM/SCU observation periods. The RSCA reliability results indicate that observer ratings were within one category for 97% of the multi-class observations and for 90% of the targeted observations (Sterbinsky & Burke, 2004).

FTL Surveys

FTL program evaluation surveys were administered to four FTL groups: students, teachers, Lead Teachers, and parents of FTL students. All surveys except the Parent Surveys were administered in an on-line format that was delivered via CREP's Survey Management System (SMS). Parent Surveys were administered using paper-based instruments distributed by the FTL teachers. Brief descriptions of each survey are below.

FTL Program Evaluation Surveys

FTL Student Survey. The FTL Student survey presented students with 16 statements regarding classroom use of FTL laptops. Students were asked to use a three-level scale (Yes, Some, No) to rate their level of agreement with each statement. The statements elicited student impressions regarding the laptops improving student learning and achievement, enjoyment of using the laptops, and desire for continued use next year. Students were then asked to indicate the degree to which they completed laptop activities alone or with other students, the typical subject areas of laptop work, and which software they most commonly used.

FTL-TTQ[®]. The Freedom to Learn Teacher Technology Questionnaire (FTL-TTQ) is an adaptation of a five-part validated Teacher Technology Questionnaire (TTQ). The adaptation from TTQ to FTL-TTQ involved replacing the terms "computers" or "technology" with "FTL laptop computers" in the 20 items. The FTL-TTQ was used to collect teacher perceptions of the FTL

program. In the first section, teachers rated their level of agreement with 20 statements regarding five technology-related areas: impact of laptop use on classroom instruction, impact of laptop use on students, teacher readiness to integrate student use of laptops, overall support for the laptop program in the school, and technical support for the laptop program. Items were rated with a five-point Likert-type scale that ranged from (1) Strongly Disagree to (5) Strongly Agree.

The second section was used to collect teacher perceptions regarding Lead Teacher effectiveness. Items focused on participation in professional development provided by the Lead Teacher, impact of Lead Teacher training on the frequency and quality of laptop lessons, and overall value of having a Lead Teacher.

FTL Lead Teacher Survey (FTL-LT). The FTL-LT was used to collect Lead Teacher perceptions of the FTL program. Lead teachers used a five-point Likert-type scale that ranged from (1) Strongly Disagree to (5) Strongly Agree to rate their level of agreement with 24 statements concerning various aspects of the FTL program. The statements concerned administration support and participation, parent support, teacher collaboration and acceptance, and overall impact of FTL on student ability, motivation and achievement. In addition Lead Teachers were asked about types of support and professional development activities they provided to program participants.

FTL Parent Survey. The FTL Parent survey was used to collect parents' perceptions of the benefits of their child using laptops at school. Specifically, parents are asked to indicate the degree (a lot, some, not at all, or not sure) that using laptops had changed their child's interest in school, research skills, achievement, writing skills, involvement in project-type school work, or the ability to work with other students. The survey also asks parents about their participation in activities sponsored by FTL.

Student Performance-Based Assessment

A Problem-Solving Task and Technology Task were administered to 6th grade students to examine the impact of FTL on student ability to solve problems and to generate computer products that reflect problem-solving solutions. These student products contained no identifying information to classify them as FTL Program or Control, which allowed trained researchers to employ a "blind"

review process to assess student performance. Student Performance-Based Assessment materials are described below and are located in the Appendix.

Student Problem-Solving Task. The purpose of the Student Problem-Solving Task (Ross, Morrison, & Lowther, 2001) was to assess student ability to comprehend problems and formulate solutions. Students were given a task sheet that presented a problem situation regarding recycling cans in a park and instructions for them to describe different aspects of how they would solve the problem.

FTL Program and Control teachers received written instructions for administering the problem-solving task that indicated students should use computers (*Microsoft Word*[®]) to complete the task within a 45-minute timeframe. Teachers were asked to read a statement to students at the beginning of the assessment that indicated they should work alone, not include their name on any documents, and do their best work. Trained reviewers judged the students' responses on a rubric composed of 7 Components x 3 Performance Levels. Components consisted of 1) understands problem, 2) identifies what is known about problem, 3) identifies what needs to be known to solve the problem, 4) determines how the data need to be manipulated to solve the problem, 5) describes use of technology, 6) describes how to present findings, and 7) collaborative learning. Data were also collected regarding student experience (none, some, a lot), frequency of use (never, once in a while, a lot), and perceived skill level (none, moderate, excellent) with *Microsoft Word*.

Student Technology Task. The intent of the Student Technology Task (Lowther & Marvin, 2004) was to determine the degree of proficiency with which 22 basic computer tasks that reflect the National Education Technology Standards (NETS) for Students in grades 6-8 (ISTE, 2000) could be completed. The performance task categories and number of items per category are as follows: spreadsheets (10), presentations (10), and Internet (2). Items assessing word processing (e.g., bolding text) were embedded within the spreadsheet and presentation categories, as these skills are similarly performed in *Excel*[®] and *PowerPoint*[®]. Before students started the Technology Task, teachers were asked to read a statement to students indicating they should work alone, not include their name on any documents, and do their best work.

Students were provided with a set of detailed instructions for “what” needed to be done to complete each task, but were not given any guidance on “how” to finish the step-by-step procedures. For example, instructions within the spreadsheet task state, “After you have entered the data into the spreadsheet, enter or select an *Excel* formula that calculates the average number of cans...” rather than “...select the Function (f_x) key and select “Average” from the list of options.”

The spreadsheet task required the students to use basic spreadsheet functions to create a chart. Specifically, the students were asked to enter data into *Excel*, use an *Excel* formula to calculate averages, and create a chart according to a number of specified requirements. The presentation task required students to create a three slide *PowerPoint* presentation with specified text and graphics. The students were asked to insert the *Excel* graph created in the spreadsheet task onto the third slide of the *PowerPoint* presentation. The Internet items (2) were embedded within the presentation tasks as students were asked to obtain content and an image from a researcher-developed website on the Internet for use in the presentation. The Student Technology Task also included six items related to the computer background of the students with regard to *Excel* spreadsheet and *PowerPoint* presentation software. In particular, the students were asked how much experience they had with the software (none, some, a lot), how often they used it (never, once in a while, a lot), and their perceived skill level (none, moderate, excellent).

Trained reviewers used a rubric to assess the two student Technology Task products (spreadsheet and presentation) on the degree to which they completed each task as described: No (0) = Did not complete task as described; Somewhat (1) = Partially completed task as described; and Yes (2) = Completed task as described. Detailed descriptions were included for the “No” and “Yes” rating of each task, while the “somewhat” rating was to be recorded by the reviewer to capture the uniqueness of “partially completed” responses

Student Academic Performance

The subjects of this analysis were 7th graders enrolled in schools that were participating in the Freedom to Learn (FTL) Program. FTL program staff identified eight schools that were considered to be implementing the program effectively. Comparisons of school-level student achievement outcomes

were made with comparable schools. These comparison schools were chosen based on key school characteristics:

- Micro-environment: preferably schools within the same district or in a neighborhood district
- SES indicator: percent free/reduced price lunch within range of (+/-10%)
- Ethnicity: percent minority within range of (+/-10%) predominant race and ethnicity of FTL school
- Performance indicator 1: Reading percent proficient within range of (+/-5%)
- Performance indicator 2: Mathematics percent proficient within range of +/-5%)
- Grade Level: similar grade spans
- School size: within 100 students of enrollment size
- Special Education: percent special education students within range of (+/-10%)

Information gleaned from the website, www.schoolmatters.com, was used to select the comparison schools based on the above criteria.

A series of 2x2 chi-square frequency analyses were conducted comparing FTL and comparison schools, to investigate the association between the program and students' achievement in four subjects: English, Math, Reading and Writing.¹

DATA COLLECTION

A data collection summary for the FTL program evaluation is presented in Table 1. A total of 485 hours of direct classroom observations were conducted in 826 FTL classrooms. Collectively, FTL participants completed 7,466 evaluations surveys. Of those, 6,225 were completed via CREP's online Survey Management System, while 1,241 parents completed paper-based evaluations.

¹ Michigan Educational Assessment Program (MEAP), (n.d.) Retrieved December 15, 2006 from http://www.michigan.gov/mde/0,1607,7-140-22709_31168---.00.html

TABLE 1. Data Collection Summary

Type	Instrument	Number Collected	Number of Schools	Procedure
Multi-Class Observations	SOM	86	86	Multi-class observations were three- hour sessions in which external researchers observed about 10 randomly selected classes for 15 minutes each. The purpose was to obtain a program-wide perspective on common teaching practices and the use of technology in FTL classrooms. One multi-class observation was conducted in FTL schools with 3 or more FTL teachers.
	SCU	86	86	
	RSCA	599	86	
Targeted Classroom Observations	SOM	227	65	Target observations were pre-arranged one-hour sessions in which FTL teachers demonstrated a prepared lesson using FTL laptops. Note forms were completed every 15 minutes of the lesson. Up to four targeted observations were conducted by Lead Teachers trained as a Site Researcher in FTL schools with two or more FTL teachers.
	SCU	227	65	
Teacher Surveys	TTQ	380	77	Administered on line and made available to all FTL schools with a Lead Teacher
Student Survey	Student Laptop Survey	5,770	76	Administered on line and made available to all FTL schools with a Lead Teacher
Parent Survey	Parent Laptop Survey	1,241	90	Paper-based copies administered to parents from one 6 th grade Lead Teacher class at all FTL schools
Lead Teacher Survey	Lead Teacher Survey	75	63	Administered on line and made available to all FTL schools with a Lead Teacher
Student Performance-Based Assessment	Problem-Solving Skills	FTL = 11 Control = 21	FTL = 1 Control = 2	The Problem-Solving Task was administered to 1 FTL Program and 2 Control 6 th grade classes from a randomly selected school.
	Technology Skills	FTL = 27 Control = 24	FTL = 1 Control = 2	The Technology Task was administered to 2 FTL Program and 2 Control 6 th grade classes from 2 randomly selected schools.
7th Grade Student Achievement	English	FTL = 669 Control = 714	FTL = 8 Control = 8	Student achievement analyses were conducted to compare the English, mathematics, reading, and writing performances of FTL program vs. control students.
	Mathematics	FTL = 668 Control = 714		
	Reading	FTL = 670 Control = 715		
	Writing	FTL = 673 Control = 715		

RESULTS

The results of the study are presented below by measurement strategy. In the Conclusion section, findings are synthesized across instruments to address achievement of FTL program goals. Regardless of design employed, Effect Sizes (*ES*) were computed using Cohen’s *d* formula (Cohen, 1988) to determine the educational importance of differences. An *ES* indicates the number of standard deviations by which the “treatment” group surpasses the “control” group. According to Cohen, an *ES* having an absolute value greater than 0.25 is considered educationally important.

Multi-Class Observation Results

A total of 86 multi-class observations were conducted in 86 FTL schools, which yielded 246 hours of direct observation in 599 FTL classrooms. The SOM, SCU, and RSCA instruments were used to collect data from each classroom. Results from the multi-class visits are presented below by observation instrument.

Multi-Class SOM

Data from unannounced, random visits to 599 FTL classrooms revealed that teachers used both traditional and student-centered strategies (see Table 2). For example, direct instruction was seen occasionally to extensively during 82.6% of the visits, while independent seatwork was seen during 73% of the visits. Yet, teachers were also observed serving as facilitators and coaches in 75.5% of the visits. Furthermore, the FTL teachers occasionally to extensively used student-centered practices such as independent research (43.0%), student discussion (38.4%), project-based learning (34.9%), cooperative learning (32.6%), and use of higher-level instructional feedback (38.4%) and questioning (38.3%).

The most frequently observed student activity was use of laptops as a learning tool, which was occasionally to extensively observed in 66.3% of the visits. Students were observed using their laptops as a delivery tool less frequently (35% of the visits). A high level of academic focus (97.7%) and a high level of student attention (89.6%) were occasionally to extensively observed during nearly all of the visits.

TABLE 2. Multi-Class SOM[®] Data Summary

2004-2005 FTL *n* = 6 schools (60 6th grade classrooms)

2005-2006 FTL *n* = 86 schools (599 classrooms from multiple grades); Norm *N* = 552 schools (5,552 classrooms)

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
<i>Instructional Orientation</i>								
Direct instruction (lecture)	04-05	50.0	16.7	33.4	2.00	1.27	2.85	0.98
	05-06	17.5	29.1	53.5	2.53	1.08	2.77	1.01
Team teaching	04-05	83.4	0.0	16.7	0.67	1.21	0.58	0.79
	05-06	88.4	7.0	4.7	0.59	0.82	0.81	0.94
Cooperative/collaborative learning	04-05	66.7	33.3	0.0	1.17	0.75	0.90	0.87
	05-06	66.3	22.1	10.5	1.06	1.12	1.08	0.98
Individual tutoring (teacher, peer, aide, adult volunteer)	04-05	100.0	0.0	0.0	0.33	0.52	0.68	0.97
	05-06	64.0	19.8	16.3	1.03	1.22	0.77	0.94
<i>Classroom Organization</i>								
Ability groups	04-05	100.0	0.0	0.0	0.50	0.55	0.84	1.25
	05-06	91.8	7.0	1.2	0.34	0.71	1.16	1.33
Multi-age grouping	04-05	100.0	0.0	0.0	0.17	0.41	0.56	1.08
	05-06	87.2	7.0	5.8	0.52	0.98	0.58	1.03
Work centers (for individuals or groups)	04-05	100.0	0.0	0.0	0.33	0.52	1.16	1.16
	05-06	95.3	2.3	2.3	0.27	0.62	1.35	1.14
<i>Instructional Strategies</i>								
Higher level instructional feedback (written or verbal) to enhance student learning	04-05	66.7	33.3	0.0	1.17	0.75	1.34	1.56
	05-06	61.6	23.3	15.1	1.34	1.13	1.44	1.15
Integration of subject areas (interdisciplinary/thematic units)	04-05	66.7	16.7	16.7	1.00	1.27	0.52	0.82
	05-06	83.8	8.1	8.1	0.72	1.00	0.54	0.80
Project-based learning	04-05	100.0	0.0	0.0	0.67	0.52	0.42	0.68
	05-06	64.0	18.6	16.3	1.16	1.18	0.45	0.76
Use of higher-level questioning strategies	04-05	66.7	16.7	16.7	1.17	1.17	1.54	1.15
	05-06	61.7	27.9	10.4	1.28	0.99	1.63	1.12
Teacher acting as a coach/facilitator	04-05	33.4	16.7	50.0	2.50	1.76	2.19	1.20
	05-06	24.4	20.9	54.6	2.42	1.24	2.29	1.18
Parent/community involvement in learning activities	04-05	100.0	0.0	0.0	0.0	0.0	0.27	0.58
	05-06	98.9	0.0	1.2	0.08	0.38	0.31	0.60
<i>Student Activities</i>								
Independent seatwork (self-paced worksheets, individual assignments)	04-05	50.0	0.0	50.0	1.83	1.33	2.50	0.98
	05-06	26.8	37.2	36.0	2.10	1.14	2.41	0.98
Experiential, hands-on learning	04-05	50.0	33.3	16.7	1.50	1.05	1.09	0.97
	05-06	79.1	16.3	4.6	0.86	0.94	1.20	1.00
Systematic individual instruction (differentiated assignments geared to individual needs)	04-05	100.0	0.0	0.0	0.17	0.41	0.32	0.69
	05-06	95.3	3.5	1.2	0.35	0.61	0.44	0.76
Sustained writing/composition (self-selected or teacher-generated topics)	04-05	100.0	0.0	0.0	0.80	0.45	0.67	0.87
	05-06	83.7	11.6	4.7	0.62	0.87	0.75	0.86
Sustained reading	04-05	83.3	16.7	0.0	0.67	0.82	1.01	0.97
	05-06	86.1	10.5	3.5	0.62	0.86	1.08	0.98

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Independent inquiry/research on the part of students	04-05	33.4	33.3	33.3	1.83	1.17	0.40	0.70
	05-06	57.0	26.7	16.3	1.34	1.04	0.32	0.65
Student discussion	04-05	33.3	50.0	16.7	1.83	0.75	0.98	1.08
	05-06	61.7	25.6	12.8	1.21	1.09	0.89	1.11
Technology Use								
Computer for instructional delivery (e.g. CAI, drill & practice)	04-05	83.3	16.7	0.0	0.83	0.75	0.89	1.0
	05-06	65.1	19.8	15.2	1.20	1.07	0.96	0.97
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation)	04-05	66.7	33.3	0.0	1.17	0.75	0.89	1.06
	05-06	33.7	22.1	44.2	2.09	1.20	0.80	0.98
Assessment								
Performance assessment strategies	04-05	83.4	16.7	0.0	0.50	0.84	0.37	0.72
	05-06	96.5	2.3	1.2	0.28	0.57	0.50	0.83
Student self-assessment (portfolios, individual record books)	04-05	83.4	16.7	0.0	0.50	0.84	0.26	0.60
	05-06	93.0	4.7	2.4	0.30	0.72	0.32	0.65
Summary Items								
High academically focused class time	04-05	33.3	16.7	50.0	2.17	0.98	3.14	0.95
	05-06	2.3	15.1	82.6	3.22	0.79	3.33	0.80
High level of student attention, interest, engagement	04-05	16.7	16.7	66.7	2.67	1.03	2.93	0.93
	05-06	10.5	19.8	69.8	2.87	0.98	3.12	0.83

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

Multi-Class SOM Inferential Results: FTL vs. National Norms.

A series of *t-tests* comparing the FTL and national norm means on the 26 SOM items showed significantly higher frequency for FTL on three items and for the SOM national norms on seven items (see Table 3 and Figure 1). The most striking difference favoring FTL was student use of the laptops as a learning tool (FTL $M = 2.09$, SOM norm $M = 0.80$; $ES = +1.07$) as this strategy directly reflects FTL program goals. Also noteworthy were the significant differences in FTL teacher use of independent inquiry and/or research (FTL $M = 1.34$, SOM norm $M = 0.32$; $ES = +0.98$) and project-based learning (FTL $M = 1.16$, SOM norm $M = 0.45$; $ES = +0.60$). The analyses revealed that the greatest significant difference that favored the national norms were the use of work centers, which is understandable since work centers are less necessary when each student has an Internet-connected laptop.

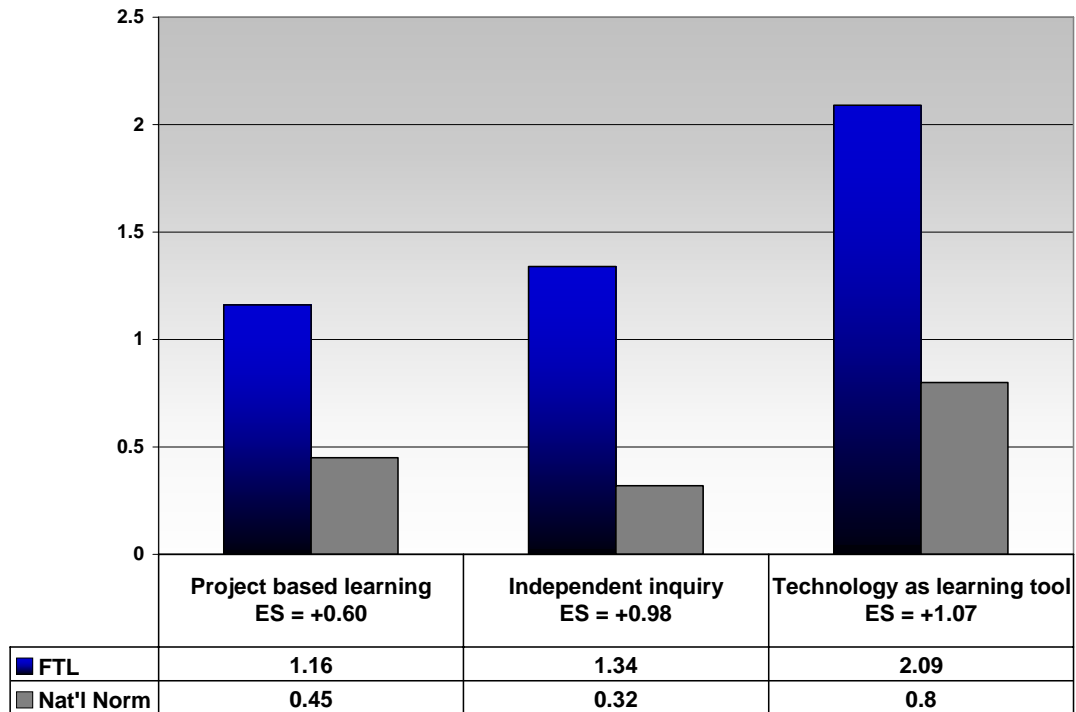
TABLE 3. Multi-Class SOM: Significant Differences Between FTL and National Norms

SOM Items	FTL (n = 86)		National Norms (N = 552)		t (85)	p*	ES
	M	SD	M	SD			
Technology as a learning tool or resource	2.09	1.20	.80	.98	9.958	.001	+1.07
Independent inquiry/research on the part of students	1.34	1.04	.32	.65	9.106	.001	+0.98
Project-based learning	1.16	1.18	.45	.76	5.567	.001	+0.60
Use of higher-level questioning strategies	1.28	.99	1.63	1.12	-3.287	.001	-0.35
Experiential, hands-on learning	.86	.94	1.20	1.00	-3.367	.001	-0.36
Performance assessment strategies	.28	.57	.50	.83	-3.615	.001	-0.39
Sustained reading	.62	.86	1.08	.98	-5.022	.001	-0.54
Parent/community involvement in learning activities	.08	.38	.31	.60	-5.544	.001	-0.60
Ability groups	.34	.71	1.16	1.33	-10.700	.001	-1.15
Work centers (for individuals or groups)	.27	.62	1.35	1.14	-16.149	.001	-1.74

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

*Bonferroni adjustment was used. Alpha is considered as .002 (.05/26)

Red Text = Norm significantly higher than FTL



Scale: 0 = Not Observed; 4 = Extensively Observed

Figure 1. Multi-Class SOM: Selected Significant Differences Between FTL and National Norms

Multi-Class SCU

As seen in Table 4, when technology use was observed in FTL classrooms, the students were equipped with and using a laptop computer. The computer literacy skills of those students ranged from moderate (36.0%) to very good (52.3%). The FTL teachers integrated a wide variety of computer activities into their instruction as 18 of the 20 (90.0%) computer applications listed on the SCU were observed during unannounced visits to 599 FTL classrooms (see Table 5). Not surprisingly, the Internet was the most commonly used tool, as it was occasionally to extensively observed during 65.1% of the visits. Other computer uses included word processing (45.4%), other research tools (1.2%), presentation software (15.1%), and drill and practice educational software (10.5%). The subject areas of the computer activities that used production tools were primarily focused on language arts (53.5%), social studies (40.7%) and science (37.2%). The Internet/research activities were fairly equally distributed across language arts (53.5%), science (52.3%), and social studies (50.0%). The uses of educational and testing software were mainly for practicing or testing mathematics knowledge and skills.

Meaningfulness of Computer Activities. When examining the meaningfulness of student computer activities, the data revealed very positive trends (see Table 5). Specifically, of all the computer activities observed during random visits to 599 classes, only 10.5% were considered “Low-level” use of computers; whereas, over 70% were rated as being “Meaningful” (54.6%) or “Somewhat Meaningful” (43.0%) use of computers. And encouragingly, over one-fourth (28%) of the student computer activities were rated as being “Very Meaningful” use of the laptops. According to SCU (Lowther & Ross, 2000), meaningful activities are those that “were problem-based, required some critical thinking skills, and some use of computer applications to locate and/or process information or some manipulation of educational software variables to reach solutions.” In contrast, low-level computer activities “in general required no critical thinking, e.g., used computer applications for copying text or free-time drawing, or used educational software for drill & practice, tutorials, or games” (p. 37).

TABLE 4. Multi-Class SCU Data Summary2004-2005 $n = 6$ (60 6th grade classrooms)2005-2006 $n = 86$ (599 FTL classrooms)

Computer Configuration	Year	%
<i>Percentages of classrooms with the following numbers of computers or digital tools:</i>		
None; One, or 2 -4	04-05	0.0
	05-06	3.5
5 – 10	04-05	16.7
	05-06	7.0
11 or more	04-05	83.3
	05-06	89.5
<i>Percentages of classrooms in which the majority of computers were:</i>		
Up-to-date	04-05	100.0
	05-06	96.5
Aging, but adequate	04-05	0.0
	05-06	1.2
Outdated/limited capacity	04-05	0.0
	05-06	0.0
<i>Percentages of classrooms in which the majority of computers were:</i>		
Connected to the Internet	04-05	100.0
	05-06	94.2
Student Computer Use		
<i>Percentage of classrooms in which computers or digital tools were used by:</i>		
Few (less than 10%) to Some (about 10-50%) students	04-05	33.4
	05-06	8.2
Most (about 51-90%) students	04-05	0.0
	05-06	15.1
Nearly all (91-100%) students	04-05	66.7
	05-06	70.9
<i>Percentage of classrooms in which students worked with computers or digital tools:</i>		
Alone	04-05	100.0
	05-06	87.2
In pairs or small groups	04-05	0.0
	05-06	7.0
<i>Percentage of classrooms in which student computer literacy skills were:</i>		
Poor	04-05	0.0
	05-06	0.0
Moderate	04-05	50.0
	05-06	36.0
Very good	04-05	50.0
	05-06	52.3
Not observed	04-05	0.0
	05-06	11.6
<i>Percentage of classrooms in which student keyboarding skills were:</i>		
Poor	04-05	0.0
	05-06	0.0
Moderate	04-05	50.0
	05-06	32.6
Very good	04-05	16.7
	05-06	38.4
Not observed	04-05	33.3
	05-06	29.1

Table 4. Continued

Digital Devices available for student use		Not or Rarely Observed	Occasionally	Frequently or Extensively
Desktop Computers	04-05	100.0	0.0	0.0
	05-06	98.8	1.2	0.0
Laptop Computers	04-05	33.3	33.3	33.3
	05-06	17.5	3.5	79.0
Personal Data Assistants (PDA)	04-05	100.0	0.0	0.0
	05-06	100.0	0.0	0.0
Graphing Calculator	04-05	100.0	0.0	0.0
	05-06	100.0	0.0	0.0
Information Processor (e.g., Alphaboard)	04-05	100.0	0.0	0.0
	05-06	100.0	0.0	0.0
Digital Accessories (e.g., camera, scanner, probes)	04-05	100.0	0.0	0.0
	05-06	97.7	1.2	0.0

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

Note. Item percentages may not total 100% because of missing data.

TABLE 5. Multi-Class SCU: Frequency of Observed Computer Activities

FTL 2004-2005 $n = 6$ (60 6th grade classrooms); National Norm $N = 563$

FTL 2005-2006 $n = 86$ (599 FTL classrooms)

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Production Tools								
Word Processing	04-05	100.0	0.0	0.0	0.67	0.52	0.42	0.81
	05-06	54.7	25.6	19.8	1.41	1.19	0.50	0.90
Database	04-05	100.0	0.0	0.0	0.0	0.0	0.01	0.15
	05-06	98.8	0.0	1.2	0.06	0.35	0.02	0.19
Spreadsheet	04-05	100.0	0.0	0.0	0.0	0.0	0.06	0.28
	05-06	98.9	1.2	0.0	0.07	0.30	0.07	0.35
Draw/Paint/Graphics	04-05	100.0	0.0	0.0	0.17	0.4	0.16	0.49
	05-06	97.7	2.3	0.0	0.21	0.46	0.19	0.57
Presentation (e.g., MS PowerPoint)	04-05	100.0	0.0	0.0	0.0	0.0	0.25	0.67
	05-06	84.9	9.3	5.8	0.56	0.89	0.26	0.68
Authoring (e.g., HyperStudio)	04-05	100.0	0.0	0.0	0.0	0.0	0.0	0.60
	05-06	97.7	2.3	0.0	0.10	0.38	0.02	0.20
Concept Mapping (e.g., Inspiration)	04-05	100.0	0.0	0.0	0.0	0.0	0.07	0.38
	05-06	98.9	1.2	0.0	0.03	0.24	0.08	0.40
Planning (e.g., MS Project)	04-05	100.0	0.0	0.0	0.0	0.0	0.0	0.60
	05-06	100.0	0.0	0.0	0.03	0.18	0.01	0.11
Other	04-05	100.0	0.0	0.0	0.0	0.0	0.11	0.46
	05-06	96.5	2.3	0.0	0.11	0.38	0.10	0.46
Internet/Research Tools								
Internet Browser (e.g., Netscape)	04-05	66.7	0.0	33.3	1.33	1.75	0.70	1.09
	05-06	34.9	20.9	44.2	2.13	1.37	0.73	1.12
CD Reference (encyclopedias, etc.)	04-05	100.0	0.0	0.0	0.17	0.41	0.04	0.27
	05-06	93.0	3.5	2.3	0.21	0.62	0.05	0.29
Communications	04-05	100.0	0.0	0.0	0.0	0.0	0.02	0.21
	05-06	97.7	0.0	0.0	0.05	0.21	0.02	0.25
Other	04-05	83.3	16.7	0.0	0.67	0.82	0.06	0.33
	05-06	98.9	1.2	0.0	0.09	0.33	0.09	0.45

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Educational Software								
Drill/Practice/Tutorial	04-05	100.0	0.0	0.0	0.0	0.0	0.71	1.01
	05-06	89.5	5.8	4.7	0.55	0.85	0.73	1.06
Problem Solving (e.g., SimCity)	04-05	100.0	0.0	0.0	0.0	0.0	0.06	0.27
	05-06	100.0	0.0	0.0	0.03	0.18	0.07	0.31
Process Tools (e.g., Geometer's Sketchpad)	04-05	100.0	0.0	0.0	0.0	0.0	0.01	0.85
	05-06	97.7	2.3	0.0	0.06	0.32	0.03	0.27
Other	04-05	83.4	16.7	0.0	0.50	0.84	0.17	0.58
	05-06	97.6	1.2	0.0	0.14	0.38	0.21	0.66
Testing Software								
Individualized/Tracked (e.g., Accelerated Reader)	04-05	100.0	0.0	0.0	0.17	0.41	0.53	0.87
	05-06	97.6	2.3	0.0	0.13	0.40	0.52	0.91
Generic	04-05	100.0	0.0	0.0	0.0	0.0	0.01	0.97
	05-06	98.8	1.2	0.0	0.06	0.28	0.02	0.20
Other	04-05	83.3	16.7	0.0	0.33	0.82	0.07	0.36
	05-06	96.5	0.0	2.4	0.16	0.59	0.08	0.41
Meaningfulness of Computer Activities								
Low level use of computers	04-05	66.7	16.7	16.7	1.17	1.17	0.85	1.12
	05-06	87.2	9.3	1.2	0.49	0.72	0.84	1.16
Somewhat meaningful use of computers	04-05	66.7	33.3	0.0	1.00	0.90	0.73	0.97
	05-06	53.5	20.9	22.1	1.51	1.19	0.75	1.00
Meaningful use of computers	04-05	50.0	33.3	16.7	1.67	1.34	0.80	1.16
	05-06	45.3	26.7	27.9	1.62	1.26	0.86	1.21
Very meaningful use of computers	04-05	100.0	0.0	0.0	0.17	0.41	0.32	0.77
	05-06	68.6	14.0	14.0	0.98	1.22	0.39	0.88

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively
Note. Item percentages may not total 100% because of missing data.

Subject Areas of Computer Activities		Language	Mathematics	Science	S. Studies	Other	Percent Not Observed
Production Tools	04-05	33.3	0.0	16.7	16.7	16.7	50.0
	05-06	53.5	19.8	37.2	40.7	22.1	19.8
Internet/Research Tools	04-05	33.3	33.3	16.7	16.7	16.7	16.7
	05-06	53.5	23.3	52.3	50.0	18.6	14.0
Educational Software	04-05	16.7	0.0	16.7	0.0	0.0	66.7
	05-06	14.0	27.9	17.4	7.0	7.0	52.3
Testing Software	04-05	16.7	16.7	0.0	16.7	0.0	66.7
	05-06	8.1	11.6	4.7	3.5	2.3	74.4

Note. Item percentages may not total 100% because of missing data and use of activities involving more than one subject area.

Multi-Class SCU Inferential Results: FTL vs. National Norms.

Comparison of multi-class SCU means with the SCU national norms revealed four significant differences (see Table 6 and Figure 2). The most prominent difference favoring FTL was student use of the Internet. Specifically, the FTL students used the Internet significantly more than students represented by the national norm (FTL $M = 2.13$, SCU norm $M = 0.73$; $ES = +1.02$). Significant FTL vs. national norm differences were also revealed with regard to use of word processing (FTL $M = 1.41$, SOM norm $M = 0.50$; $ES = +0.76$) and presentation software (FTL $M = 0.56$, SOM norm $M = 0.26$; $ES = +0.34$). Interestingly, the analyses revealed that the greatest significant difference that favored the national norms was student use of tracked, individualized testing software (FTL $M = 0.13$, SOM norm $M = 0.52$; $ES = -0.98$), which is typically associated with structured core content intervention programs such as Accelerated Reading or Accelerated Math. Since the FTL program focuses on using laptops as learning rather than assessment tools, this difference is not unexpected.

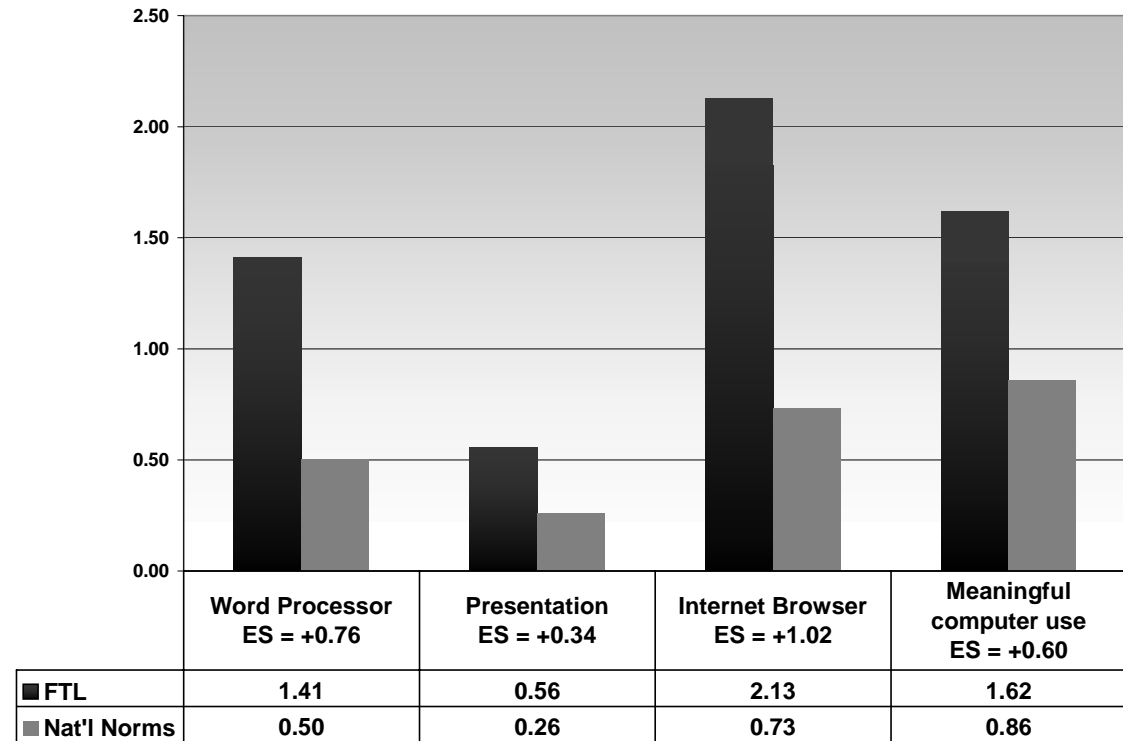
Overall Meaningful Use of Computers. The analysis revealed significant FTL vs. national norm differences on the four levels of the “Meaningful” use of computers rubric (see Table 6). The greatest differences were seen in FTL teacher use of “Meaningful” ($ES = +0.60$) and “Somewhat meaningful” ($ES = +0.62$) computer activities. Also promising is the significantly greater ($ES = +0.47$) use of “Very meaningful” computer activities coupled with the significantly lower ($ES = -0.48$) use of “Low-level” activities.

TABLE 6. Multi-Class SCU: Significant Differences Between FTL and National Norms

SCU ITEMS	Program (n = 86)		National Norms (N = 563)		t (85)	p	ES
	M	SD	M	SD			
COMPUTER ACTIVITIES							
<i>Production Tools</i>							
Word Processor	1.41	1.19	.50	.90	7.057	.001	+0.76
Presentation	.56	.89	.26	.68	3.109	.003	+0.34
<i>Internet/Research Tools</i>							
Internet Browser	2.13	1.37	.73	1.12	9.461	.001	+1.02
<i>Testing Software</i>							
Individualized/Tracked	.13	.40	.52	.87	-9.093	.001	-0.98
MEANINGFULNESS							
Low level use of computers	.49	.72	.84	1.16	-4.482	.001	-0.48
Somewhat meaningful use of computers	1.51	1.19	.75	1.00	5.772	.001	+0.62
Meaningful use of computers	1.62	1.26	.86	1.21	5.579	.001	+0.60
Very meaningful use of computers	.98	1.22	.39	.88	4.377	.001	+0.47

**p < .003

Rating scale: 0 = Not observed; 4 = Extensively
Red Text = Norm significantly higher than FTL



Scale: 0 = Not Observed; 4 = Extensively Observed

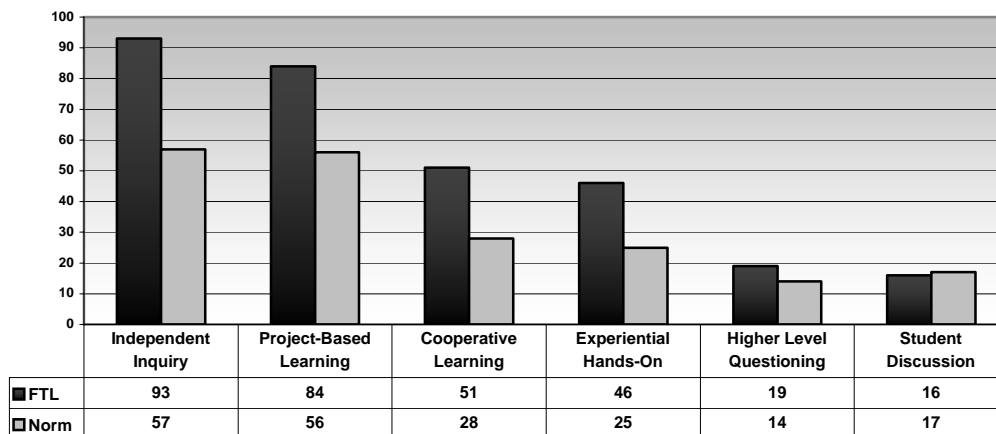
Figure 2. Multi-Class SCU: Selected Significant Differences Between FTL and National Norms

Rubric for Student-Centered Activities (RSCA)

Results address the percentage of multi-class sessions in which each RSCA strategy was observed at least once, the quality/depth of observed strategy applications, and the percentage of sessions in which technology was used with the observed strategy. When an RSCA strategy was observed, the implementation was rated with the following scale (1 = limited application to 4 = strong application). Therefore, when reviewing the RSCA mean scores, it is important to note the frequency with which the strategy was observed when examining the overall ratings.

A descriptive summary of the 2005-2006 FTL and national norm data are presented in Table 7. The RSCA was not used during classroom observations during 2004-2005. The results suggest that FTL teachers implemented somewhat strong applications of “Experiential Hands-On Learning” ($M = 2.79$), “Project-Based Learning” ($M = 2.74$), and use of “Higher-Level Questioning” ($M = 2.07$). FTL teachers were also able to implement somewhat strong applications of “Students as Producers of Knowledge” ($M = 2.12$), which involves student use of technology as a tool.

RSCA Technology Use. As might be expected, technology was used to support all RSCA strategies to a greater extent in FTL classes as compared to the national norm, except for Student Discussion (FTL = 15.7%, Norm = 16.5%) (Figure 3). Understandably, technology was most frequently used to support student independent inquiry, such as searching for information on the Internet (93.3%) and to support project-based learning (83.6%).



Note. “Students as producers of knowledge” is not included because use of technology is a required component.

FIGURE 3. Percent of FTL vs. National Norm Multi-Class RSCA with Technology Use

TABLE 7. Multi-Class RSCA: Percent of Observed Strategies by Application Strength and Technology Use

2004-2005 = NA (RSCA was not used)
 2005-2006 $n = 599$; RSCA National Norm $N = 1,788$

Item	% Observed		Limited Application 1		Somewhat Limited Application 2		Somewhat Strong Application 3		Strong Application 4		Mean		Technology Used		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	FTL	Nat. Norm	<i>n</i>	%	%
Experiential Hands-On	84	14.0	10	11.9	21	25.0	30	35.7	23	27.4	2.79	2.46	39	46.4	25.1
Project-Based Learning	110	18.4	21	19.1	23	20.9	30	27.3	36	32.7	2.74	2.58	92	83.6	55.8
Higher level Questioning	133	22.2	51	38.3	34	25.6	36	27.1	12	9.0	2.07	2.21	25	18.8	14.4
Cooperative Learning	109	18.2	45	41.3	33	30.3	21	19.3	10	9.2	1.96	2.16	55	50.5	27.8
Student Discussion	134	22.4	69	51.5	35	26.1	21	15.7	9	6.7	1.78	2.07	21	15.7	16.5
Independent Inquiry	194	32.4	102	52.6	51	26.3	26	13.4	15	7.7	1.76	2.05	181	93.3	57.0
Students as Producers	244	40.8	87	35.7	75	30.7	48	19.7	34	13.9	2.12	2.08	N/A	N/A	N/A

RSCA Inferential results: FTL vs. National Norms

Inferential analyses (*t*-test for independent samples) were conducted to compare FTL vs. national norm RSCA rubric ratings. As seen in Table 8, the quality with which FTL teachers implemented experiential, hands-on learning experiences for FTL students was significantly higher than that of teachers represented in the national norms ($p = .003$; $ES = +0.33$). The results, on the other hand, favored the national norms on two strategies: independent inquiry ($p = .001$; $ES = -0.30$) and student discussion ($p = .001$; $ES = -0.31$).

TABLE 8. Multi-class RSCA: Significant Differences Between FTL and National Norms

RSCA Items	Program ($n = 599$)		National Norms	<i>t</i>	<i>df</i>	<i>p</i>	<i>ES</i>
	<i>M</i> *	<i>SD</i>	<i>M</i>				
Experiential hands-on learning	2.79	.98	2.46	3.03	83	.003	0.33
Independent inquiry/research	1.76	.95	2.05	-4.17	193	.001	-0.30
Student discussion	1.78	.94	2.07	-3.59	133	.001	-0.31

** $p < .007$

Rating scale: 1 = Limited Application; 4 = Strong Application
 Red Text = Norm significantly higher than FTL

Targeted Classroom Observation Results

Targeted observations were conducted in 227 FTL classrooms. The data were collected with SOMs and SCUs during prearranged one-hour sessions in which FTL teachers were asked to implement a prepared lesson using the FTL laptops.

Targeted SOM

Data from targeted visits to FTL classrooms revealed that the teachers primarily implemented student-centered activities during the observations (see Table 9). Specifically, the following activities were observed frequently or extensively during the indicated percentages of visits: teachers acting as facilitators and coaches (62.5%), project-based learning (37.9%), integration of subject areas (23.4%), higher-level questioning (20.7%) and higher-level instructional feedback (23.4%). Of key interest to this study, the students were frequently to extensively using their laptops as a tool to support and enhance their learning activities (72.2%), which included independent research (45.0%), and experiential hands-on learning (22.9%). Teachers and students were also frequently to extensively observed using the laptops for instructional delivery purposes in 26.5% of the classrooms. The majority of the targeted classrooms frequently to extensively had a high academic focus (85.5%) and high student engagement and interest (86.3%).

TABLE 9. Targeted SOM[®] Data Summary

2004-2005 FTL $n = 16$ 6th grade classrooms; National Norm $N = 552$
 2005-2006 FTL $n = 227$; National Norm $N = 552$

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
<i>Instructional Orientation</i>								
Direct instruction (lecture)	04-05	6.3	50.0	37.5	2.40	0.99	2.85	0.98
	05-06	38.3	32.2	29.1	1.82	1.25	2.77	1.01
Team teaching	04-05	87.5	0.0	12.6	0.44	1.21	0.58	0.79
	05-06	88.9	3.1	5.3	0.31	0.91	0.81	0.94
Cooperative/collaborative learning	04-05	62.5	6.3	31s.3	1.13	1.54	0.90	0.87
	05-06	66.5	10.6	19.9	0.97	1.42	1.08	0.98
Individual tutoring (teacher, peer, aide, adult volunteer)	04-05	68.8	18.8	12.5	0.75	1.18	0.68	0.97
	05-06	70.1	13.7	13.6	0.81	1.33	0.77	0.94
<i>Classroom Organization</i>								
Ability groups	04-05	68.8	12.5	12.5	0.80	1.47	0.84	1.25
	05-06	78.0	4.4	16.3	0.68	1.35	1.16	1.33
Multi-age grouping	04-05	75.0	12.5	6.3	0.53	1.19	0.56	1.08
	05-06	86.7	4.4	7.5	0.42	1.06	0.58	1.03
Work centers (for individuals or groups)	04-05	81.3	6.3	6.3	0.40	0.91	1.16	1.16
	05-06	85.9	4.8	7.9	0.41	1.05	1.35	1.14
<i>Instructional Strategies</i>								
Higher level instructional feedback (written or verbal) to enhance student learning	04-05	75.0	12.5	12.5	0.75	1.13	1.34	1.56
	05-06	51.6	22.5	23.4	1.38	1.4	1.44	1.15
Integration of subject areas (interdisciplinary/thematic units)	04-05	81.3	0.0	18.8	0.56	1.21	0.52	0.82
	05-06	62.9	11.5	23.4	1.13	1.52	0.54	0.80
Project-based learning	04-05	68.8	6.3	25.1	1.06	1.69	0.42	0.68
	05-06	53.7	7.0	37.9	1.60	1.78	0.45	0.76
Use of higher-level questioning strategies	04-05	75.0	12.5	12.5	0.81	1.28	1.54	1.15
	05-06	52.0	23.3	20.7	1.32	1.36	1.63	1.12
Teacher acting as a coach/facilitator	04-05	18.8	12.5	68.8	2.69	1.20	2.19	1.20
	05-06	20.7	15.9	62.5	2.65	1.42	2.29	1.18
Parent/community involvement in learning activities	04-05	93.8	6.3	0.0	0.19	0.54	0.27	0.58
	05-06	95.2	0.0	1.8	0.07	0.48	0.31	0.60
<i>Student Activities</i>								
Independent seatwork (self-paced worksheets, individual assignments)	04-05	37.6	12.5	50.0	2.06	1.65	2.50	0.98
	05-06	45.8	8.8	43.6	1.88	1.73	2.41	0.98
Experiential, hands-on learning	04-05	62.5	6.3	31.3	1.06	1.44	1.09	0.97
	05-06	68.7	6.6	22.9	0.98	1.48	1.20	1.00
Systematic individual instruction (differential assignments geared to individual needs)	04-05	75.0	6.3	18.8	0.75	1.39	0.32	0.69
	05-06	88.1	5.3	4.8	0.37	0.90	0.44	0.76
Sustained writing/composition (self-selected or teacher-generated topics)	04-05	93.8	0.0	6.3	0.19	0.75	0.67	0.87
	05-06	77.1	7.9	13.2	0.67	1.28	0.75	0.86
Sustained reading	04-05	81.3	12.5	6.3	0.50	0.97	1.01	0.97
	05-06	86.4	6.2	5.7	0.41	0.94	1.08	0.98

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Independent inquiry/research on the part of students	04-05	25.1	18.8	56.3	2.44	1.50	0.40	0.70
	05-06	44.0	10.1	45.0	1.83	1.67	0.32	0.65
Student discussion	04-05	50.0	25.0	25.0	1.50	1.32	0.98	1.08
	05-06	69.6	16.7	12.3	0.86	1.20	0.89	1.11
Technology Use								
Computer for instructional delivery (e.g. CAI, drill & practice)	04-05	56.3	12.5	31.3	1.38	1.59	0.89	1.00
	05-06	58.5	14.1	26.5	1.32	1.56	0.96	0.97
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation)	04-05	18.0	12.5	68.8	2.75	1.53	0.99	1.06
	05-06	18.5	8.8	72.2	2.93	1.50	0.80	0.98
Assessment								
Performance assessment strategies	04-05	81.3	18.8	0.0	0.38	0.80	0.37	0.72
	05-06	73.5	8.4	17.6	0.81	1.37	0.50	0.83
Student self-assessment (portfolios)	04-05	81.3	0.0	18.8	0.63	1.36	0.26	0.60
	05-06	81.9	6.2	8.8	0.46	1.06	0.32	0.65
Summary Items								
High academically focused class time	04-05	0.0	25.0	75.0	3.06	0.77	3.14	0.95
	05-06	4.4	10.1	85.5	3.27	0.95	3.33	0.80
High level of student attention, interest, engagement	04-05	0.0	31.3	68.8	2.88	0.72	2.93	0.93
	05-06	6.6	7.0	86.3	3.28	0.96	3.12	0.83

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

Targeted SOM Inferential Results: FTL vs. National Norms.

A series of *t-tests* comparing the FTL and national norm means on the 26 SOM items showed significantly higher frequency for FTL on seven items and for the SOM national norms on five items (Table 10). As was seen in the multi-class SOM results, the most striking difference favoring FTL was student use of the laptops as a learning tool ($ES = +1.42$) and for instructional delivery ($ES = +0.23$). Also noteworthy were the significant differences in FTL students engaging in independent research ($ES = +0.90$) and project-based learning ($ES = +0.64$). Also encouraging were differences in teachers acting as a facilitator, with FTL teachers engaging in this practice significantly more than those represented in the norm ($ES = +0.25$). In addition, the FTL teachers implemented lessons that integrated subject areas ($ES = +0.38$) and used performance assessments ($ES = +0.22$) significantly more than the norm. On the other hand, the analyses revealed significant differences that favored the national norms were for teacher use of higher-level questioning, independent seatwork, sustained reading, direct instruction, and the use of work centers. These strategies primarily reflect teacher-centered environments.

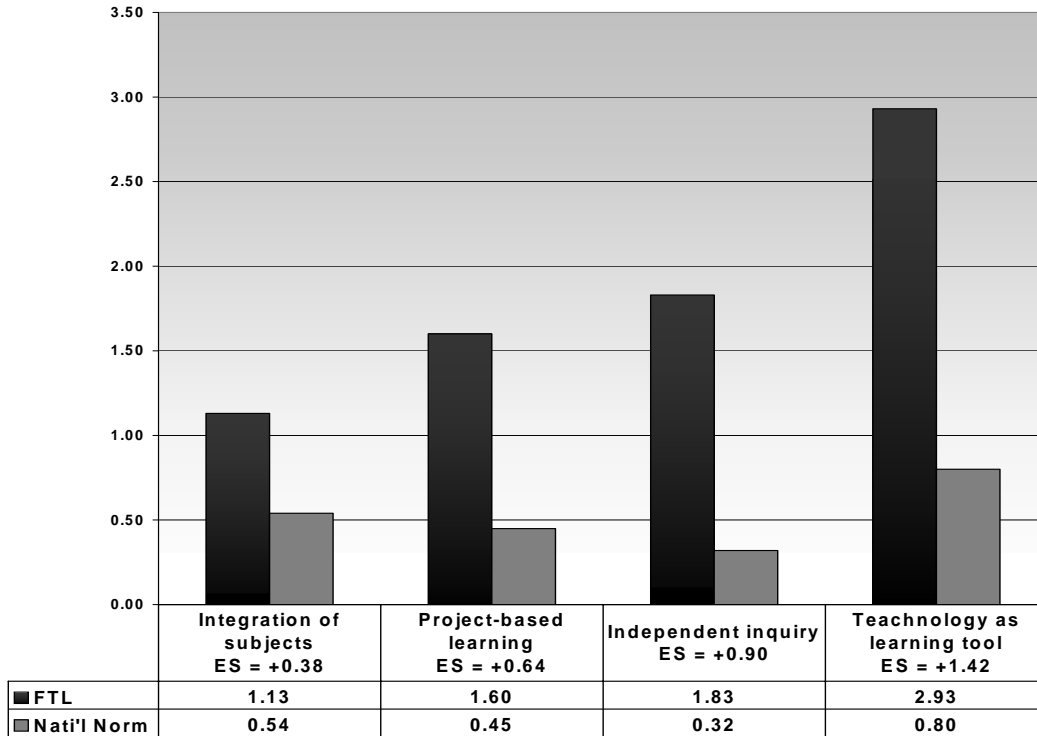
TABLE 10. Targeted SOM: Significant Differences Between FTL and National Norms

SOM Items	FTL (n = 227)		National Norms (N = 552)		t (85)	p*	ES
	M	SD	M	SD			
Technology as a learning tool	2.93	1.50	.80	.98	21.411	.001	1.42
Independent inquiry/research	1.83	1.67	.32	.65	13.538	.001	0.90
Project-based learning	1.60	1.78	.45	.76	9.659	.001	0.64
Integration of subject areas	1.13	1.52	.54	.80	5.786	.001	0.38
Teacher acting as a coach/facilitator	2.65	1.42	2.29	1.18	3.793	.001	0.25
Computer for instructional delivery	1.32	1.56	.96	.97	3.414	.001	0.23
Performance assessment strategies	.81	1.37	.50	.83	3.354	.001	0.22
Use of higher-level questioning	1.32	1.36	1.63	1.12	-3.413	.001	-0.23
Independent seatwork	1.88	1.73	2.41	.98	-4.573	.001	-0.30
Sustained reading	.41	.94	1.08	.98	-10.606	.001	-0.70
Direct instruction	1.82	1.25	2.77	1.01	-11.475	.001	-0.76
Work centers	.41	1.05	1.35	1.14	-13.502	.001	-0.90

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

*Bonferroni adjustment was used. Alpha is considered as .002 (.05/26)

Red Text = Norm significantly higher than FTL



Scale: 0 = Not Observed; 4 = Extensively Observed

Figure 4. Targeted SOM: Selected Significant Differences Between FTL and National Norms

Targeted SCU

Not surprisingly, student use of laptops was observed during *all* targeted visits. One-to-one use of the laptops was observed during 84% of the visits, whereas, during 15% of the visits the laptops were used by pairs or small groups of students (see Table 11). Over half (56.5%) of the students exhibited very good computer literacy skills, whereas approximately a third (28.7%) showed very good keyboarding skills. Teachers used a wide variety of software activities during targeted visits to FTL classrooms as students were observed frequently to extensively using 18 of the 20 SCU computer applications (Table 12). During 60% (59.7%) of the visits, students frequently to extensively used Internet browsers, and in over 30% (31.0%) of the visits students were observed using word processing. Frequent use of the following types of software was seen less often: presentation (17.1%), CD-reference materials (16.1%), and drill and practice (10.3%). The subject area of Internet activities were fairly equally distributed across language arts (35.0%), social studies (29.6%) and science (28.3%). The largest percentage (43.9%) of computer activities involving production tools were focused on language arts, while smaller percentages involved mathematics, science and social studies.

Meaningfulness of Computer Activities. The targeted SCU revealed very positive results with regard to FTL teachers implementing lessons that engaged students in meaningful and very meaningful activities. Specifically, the majority (82.0%) of computer activities observed in 227 FTL classes were considered to be meaningful (50.2%) or very meaningful (31.8%). In contrast, low-level use of computers was observed frequently to extensively in only 8.0% of visits.

TABLE 11. Targeted SCU Data Summary2004-2005 *n* = 16 6th grade FTL classrooms2005-2006 *n* = 227 FTL classrooms

Computer Configuration	Year	%
<i>Percentages of classrooms with the following numbers of computers or digital tools:</i>		
None; One, or 2–4	04-05	0.0
	05-06	1.7
5 – 10	04-05	0.0
	05-06	3.1
11 or more	04-05	100.0
	05-06	95.1
<i>Percentages of classrooms in which the majority of computers were:</i>		
Up-to-date	04-05	100.0
	05-06	96.4
Aging, but adequate	04-05	0.0
	05-06	2.7
Outdated/limited capacity	04-05	0.0
	05-06	0.4
<i>Percentages of classrooms in which the majority of computers were:</i>		
Connected to the Internet	04-05	100.0
	05-06	96.9
Student Computer Use	Year	%
<i>Percentage of classrooms in which computers or digital tools were used by:</i>		
Few (less than 10%) to Some (about 10-50%) students	04-05	0.0
	05-06	6.2
Most (about 51-90%) students	04-05	12.5
	05-06	7.6
Nearly all (91-100%) students	04-05	87.5
	05-06	83.4
<i>Percentage of classrooms in which students worked with computers or digital tools:</i>		
Alone	04-05	75.0
	05-06	83.4
In pairs or small groups	04-05	25.0
	05-06	14.8
<i>Percentage of classrooms in which student computer literacy skills were:</i>		
Poor	04-05	0.0
	05-06	0.4
Moderate	04-05	87.5
	05-06	39.0
Very good	04-05	12.5
	05-06	56.5
Not observed	04-05	0.0
	05-06	3.6
<i>Percentage of classrooms in which student keyboarding skills were:</i>		
Poor	04-05	6.3
	05-06	5.4
Moderate	04-05	68.6
	05-06	42.6
Very good	04-05	6.3
	05-06	28.7
Not observed	04-05	18.8
	05-06	23.3

Table 11 continued

Digital Devices available for student use		Not or Rarely Observed	Occasionally	Frequently or Extensively
Desktop Computers	04-05	100.0	0.0	0.0
	05-06	92.4	2.7	4.0
Laptop Computers	04-05	0.0	6.3	93.7
	05-06	4.4	3.1	92.4
Personal Data Assistants (PDA)	04-05	100.0	0.0	0.0
	05-06	98.2	0.4	0.9
Graphing Calculator	04-05	100.0	0.0	0.0
	05-06	97.3	1.3	0.8
Information Processor (e.g., Alphaboard)	04-05	100.0	0.0	0.0
	05-06	99.1	0.4	0.0
Digital Accessories (e.g., camera, scanner, probes)	04-05	93.8	0.0	6.3
	05-06	96.0	1.3	2.2

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively
 Note. Item percentages may not total 100% because of missing data.

TABLE 12. Targeted SCU: Frequency of Observed Computer Activities

2004-2005 $n = 16$ 6th grade FTL classrooms
 2005-2006 $n = 227$ FTL classrooms

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Production Tools								
Word Processing	04-05	43.8	12.5	33.3	1.81	1.76	0.42	0.81
	05-06	57.0	12.1	31.0	1.41	1.64	0.50	0.90
Database	04-05	100.0	0.0	0.0	0.06	0.25	0.01	0.15
	05-06	97.3	0.9	1.3	0.08	0.44	0.02	0.19
Spreadsheet	04-05	93.8	6.3	0.0	0.13	0.50	0.06	0.28
	05-06	88.7	4.0	6.7	0.34	1.02	0.07	0.35
Draw/Paint/Graphics	04-05	81.3	18.8	0.0	0.44	0.81	0.16	0.49
	05-06	94.6	3.6	1.3	0.14	0.52	0.19	0.57
Presentation (e.g., MS PowerPoint)	04-05	81.3	6.3	12.6	0.56	1.26	0.25	0.67
	05-06	80.2	2.2	17.1	0.69	1.41	0.26	0.68
Authoring (e.g., HyperStudio)	04-05	100.0	0.0	0.0	0.0	0.0	0.0	0.60
	05-06	99.1	0.4	0.0	0.02	0.16	0.02	0.20
Concept Mapping (e.g., Inspiration)	04-05	100.0	0.0	0.0	0.0	0.0	0.07	0.38
	05-06	95.0	1.8	2.7	0.14	0.65	0.08	0.40
Planning (e.g., MS Project)	04-05	100.0	0.0	0.0	0.06	0.25	0.0	0.60
	05-06	99.5	0.0	0.0	0.0	0.07	0.01	0.11
Other	04-05	81.3	6.3	12.5	0.63	1.40	0.11	0.46
	05-06	83.8	2.7	4.4	0.25	0.87	0.10	0.46
Internet/Research Tools								
Internet Browser (e.g., Netscape)	04-05	37.5	12.5	5.0	2.19	1.75	0.70	1.09
	05-06	31.8	8.1	59.7	2.40	1.70	0.73	1.12
CD Reference (encyclopedias, etc.)	04-05	81.3	12.5	6.3	0.50	1.16	0.04	0.27
	05-06	71.3	9.0	16.1	0.80	1.36	0.05	0.29
Communications	04-05	100.0	0.0	0.0	0.0	0.0	0.02	0.21
	05-06	92.3	2.2	1.3	0.11	0.54	0.02	0.25
Other	04-05	93.8	6.3	0.0	0.13	0.50	0.06	0.33
	05-06	82.0	0.9	5.8	0.27	0.96	0.09	0.45

The extent to which each of the following was observed in the classroom.		Percent Observed			FTL		National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Mean	Standard Deviation
Educational Software								
Drill/Practice/Tutorial	04-05	87.5	0.0	12.5	0.50	1.37	0.71	1.01
	05-06	84.7	4.0	10.3	0.47	1.16	0.73	1.06
Problem Solving (e.g., SimCity)	04-05	93.8	0.0	6.3	0.19	0.75	0.06	0.27
	05-06	95.9	1.3	1.3	0.10	0.50	0.07	0.31
Process Tools (e.g., Geometer's Sketchpad)	04-05	100.0	0.0	0.0	0.0	0.0	0.01	0.85
	05-06	96.4	0.9	0.8	0.05	0.39	0.03	0.27
Other	04-05	87.5	6.3	6.3	0.38	1.09	0.17	0.58
	05-06	87.4	0.9	6.2	0.27	0.93	0.21	0.66
Testing Software								
Individualized/Tracked (e.g., Accelerated Reader)	04-05	93.8	0.0	6.3	0.25	1.00	0.53	0.87
	05-06	91.0	0.9	7.1	0.29	1.01	0.52	0.91
Generic	04-05	93.8	0.0	6.3	0.25	1.00	0.01	0.97
	05-06	96.9	0.0	0.4	0.03	0.29	0.02	0.20
Other	04-05	75.0	0.0	25.0	0.94	1.69	0.07	0.36
	05-06	86.1	1.3	5.3	0.26	0.91	0.08	0.41
Subject Areas of Computer Activities							Percent Not Observed	
Production Tools	04-05	31.3	25.0	25.0	18.8	0.0	25.0	
	05-06	43.9	16.6	23.8	22.9	8.5	26.5	
Internet/Research Tools	04-05	31.3	12.5	25.0	25.0	0.0	25.0	
	05-06	35.0	15.7	28.3	29.6	8.1	22.9	
Educational Software	04-05	6.3	12.5	12.5	0.0	0.0	68.8	
	05-06	9.0	12.1	7.6	9.0	2.2	67.3	
Testing Software	04-05	0.0	0.0	6.3	6.3	0.0	87.5	
	05-06	8.5	6.3	3.1	3.1	1.3	74.4	
Meaningfulness of Computer Activities								
Low level use of computers	04-05	93.8	0.0	6.3	0.19	0.75	0.85	1.12
	05-06	80.3	8.5	8.0	0.57	1.06	0.84	1.16
Somewhat meaningful use of computers	04-05	62.6	12.5	25.1	1.25	1.65	0.73	0.97
	05-06	61.0	17.0	18.8	1.13	1.42	0.75	1.00
Meaningful use of computers	04-05	37.5	6.3	56.3	2.13	1.78	0.80	1.16
	05-06	36.3	10.3	50.2	2.05	1.58	0.86	1.21
Very meaningful use of computers	04-05	62.6	6.3	31.3	1.19	1.51	0.32	0.77
	05-06	56.9	9.4	31.8	1.44	1.68	0.39	0.88

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively
Note. Item percentages may not total 100% because of missing data.

Targeted SCU Inferential Results: FTL vs. National Norms. Table 13 lists significant results from *t*-tests comparing the SCU means for FTL with national norms. When examining student computer activities, the analyses revealed that FTL students used the following five software applications significantly more than students in classes represented by the national norms: Internet browsers ($ES = +0.98$); word processing ($ES = +0.55$); CD references ($ES = +0.54$); presentation

software ($ES = +0.30$); and spreadsheets ($ES = +0.27$). But even more importantly, as compared to national norms, FTL students were more frequently engaged in meaningful (FTL $M = 2.05$, National norm $M = 0.86$; $ES = +0.74$) and very meaningful (FTL $M = 1.44$, National norm $M = 0.39$; $ES = +0.62$) computer activities. In contrast, students represented by the national norms were more frequently engaged in low-level uses of computers than were FTL students (FTL $M = 0.57$, National norm $M = 0.84$; $ES = -0.25$).

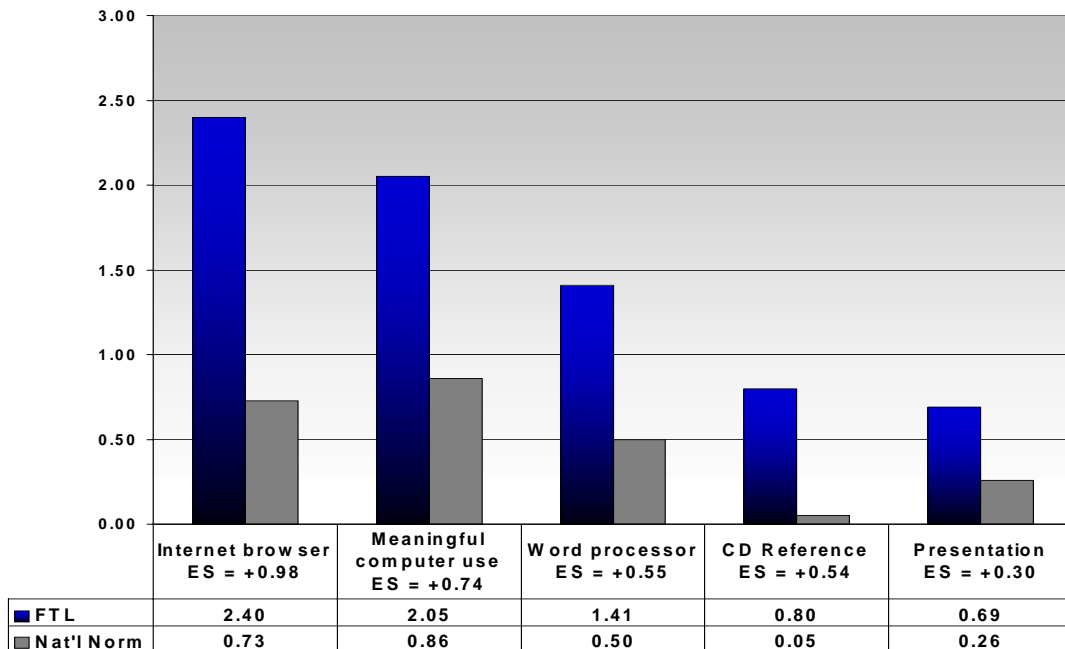
TABLE 13. Targeted SCU: Significant Differences Between FTL and National Norms

COMPUTER ACTIVITIES	Program ($n = 227$)		National Norms ($N = 563$)		$t(85)$	ES
	M	SD	M	SD		
<i>Production Tools</i>						
Word Processor	1.41	1.64	.50	8.263	.001	0.55
Spreadsheet	.34	1.02	.07	3.978	.001	0.27
Presentation	.69	1.41	.26	4.524	.001	0.30
<i>Internet/Research Tools</i>						
Internet Browser	2.40	1.70	.73	14.637	.001	0.98
CD Reference	.80	1.36	.05	8.065	.001	0.54
<i>Educational Software</i>						
Drill/Practice/Tutorial	.47	1.16	.73	-3.330	.001	-0.22
<i>Testing Software</i>						
Individualized/Tracked	.29	1.01	.52	-3.329	.001	-0.22
MEANINGFULNESS						
Low level use of computers	.57	1.06	.84	-3.756	.001	-0.25
Somewhat meaningful use of computers	1.13	1.42	.75	3.979	.001	0.27
Meaningful use of computers	2.05	1.58	.86	11.101	.001	0.74
Very meaningful use of computers	1.44	1.681	.39	9.269	.001	0.62

** $p < .003$

Rating scale: 0 = Not observed; 4 = Extensively

Red Text = Norm significantly higher than FTL



Scale: 0 = Not Observed; 4 = Extensively Observed

Figure 5. Targeted SCU: Selected Significant Differences Between FTL and National Norms

Survey Results

Survey results for the FTL program evaluation are reported by FTL students, teachers, Lead Teachers, and parents.

FTL Student Survey

The FTL Student Survey was completed by 5,770 students, primarily in the 6th grade, in classrooms equipped with FTL laptops. The results are shown in Table 14 and Figure 6. Overall, the students were very positive with regard to the benefits of having laptop computers to use at school. In particular, 90% (89.9%) of the students wanted to use them again next year. This response is supported in 87.8% of the students indicating that they were “very glad” that they got to use laptops. There was also strong agreement that use of the laptops had improved their Internet research skills (68.8%), made it easier to do school work (62.3%), made them more interested in learning (59.6%), would help them get better jobs in the future (58.9%). Fewer students agreed that laptops made

them want to get better grades (40.7%), helped them to remember more and do better on tests (37.3%), or improved their writing (30.9%).

When asked how they used the FTL laptops, the majority of students indicated that they most frequently worked alone (80.2%), however, over one-fourth (28.9%) reported that they also frequently worked with one other student during laptop activities. Students indicated that they most frequently used the laptops for language arts (57.7%), social studies (52.5%), and science (46.6%), whereas the least frequent use was reported for mathematics (34.1%). Nearly 90% (87.6%) of the students indicated that they frequently used the Internet for class activities, while almost 73% (72.3%) reported frequent use of word processing. Other software use ranged from 55.0% for presentation and 38.0% for games to a low of 7.8% for *Squeak* and 7.4% for *Ready, Set, Go!*.

TABLE 14. FTL Student Survey results2004-2005 *n* = 4,2452005-2006 *n* = 5,770

Items sorted by highest level of response to "Yes"		Percent of Student Responses		
		Yes	Some	No
I would like to use laptop computers again next year.	04-05	87.9	6.9	3.9
	05-06	89.9	6.3	3.1
I am very glad that I get to use laptops.	04-05	85.3	10.2	3.2
	05-06	87.8	9.3	2.2
My Internet research skills have improved since using the laptops.	04-05	61.3	26.7	10.7
	05-06	68.8	22.2	8.3
Using a laptop in class has made me more interested in learning.	04-05	61.1	27.0	10.7
	05-06	59.6	29.0	10.8
It is easier to do my schoolwork when I use a laptop.	04-05	59.9	28.5	10.1
	05-06	62.3	28.2	8.8
I will be able to get a better job because I have good computer skills.	04-05	58.1	31.4	8.8
	05-06	58.9	31.2	9.1
My computer skills have improved because I use a laptop at school.	04-05	55.0	35.2	8.7
	05-06	63.5	30.2	5.7
I learn more when I use a laptop computer	04-05	53.6	35.4	9.8
	05-06	54.3	36.7	8.2
My schoolwork is better when I use the laptop.	04-05	49.7	36.1	12.3
	05-06	50.1	37.9	11.0
Using the laptop makes me think more about the subject we are learning	04-05	49.2	33.2	15.6
	05-06	48.1	33.0	17.8
The laptop makes it easier to work with other students.	04-05	48.1	32.2	18.5
	05-06	49.3	32.5	17.6
Using laptops will make me a better high school student.	04-05	46.9	37.5	13.8
	05-06	49.1	37.0	13.0
I look forward to schoolwork because I get to use a laptop.	04-05	45.0	33.5	19.8
	05-06	43.6	33.3	22.1
Using a laptop has made me want to get better grades.	04-05	41.5	33.0	24.3
	05-06	40.7	34.7	23.9
Using a laptop helps me to remember more and do better on tests.	04-05	36.9	38.8	22.5
	05-06	37.3	40.2	21.6
My writing has improved because I use a laptop.	04-05	27.1	31.2	40.4
	05-06	30.9	32.9	35.4
How often do you use the laptop in the following ways in the classroom?		Frequently and A Lot	Occasionally	Never and Rarely
By Yourself	04-05	68.3	15.0	13.7
	05-06	80.2	11.1	6.9
With one other student	04-05	26.3	30.4	39.2
	05-06	28.9	33.0	34.9
In groups of 3 or more students	04-05	15.3	14.5	65.8
	05-06	13.0	16.0	67.4

Table 14 continued

How often do you use the laptop for the following subjects?		Frequently and A Lot	Occasionally	Never and Rarely
Social Studies	04-05	51.9	18.8	25.4
	05-06	52.5	18.0	26.8
Sciences	04-05	43.5	22.0	30.7
	05-06	46.6	25.2	25.6
Language Arts	04-05	42.0	21.6	32.9
	05-06	57.7	18.4	21.4
Mathematics	04-05	24.2	19.7	52.2
	05-06	34.1	22.5	40.9

How often do you use the following software when doing activities with your laptop?		Frequently and A Lot	Occasionally	Never and Rarely
Internet (Explorer/Netscape)	04-05	79.6	7.6	10.0
	05-06	87.6	4.6	6.1
Word Processing (MS Word)	04-05	58.7	16.2	22.6
	05-06	72.8	11.4	14.1
Presentation (PowerPoint)	04-05	41.7	20.7	34.6
	05-06	55.0	20.1	22.9
Games	04-05	37.0	21.7	38.0
	05-06	38.0	21.4	38.3
CD Reference (e.g., Encarta)	04-05	27.4	18.6	49.9
	05-06	32.7	18.5	45.9
Educational Software (e.g., math practice)	04-05	19.0	17.4	60.0
	05-06	28.1	17.5	51.5
Discourse	04-05	17.9	16.0	62.7
	05-06	21.4	14.5	60.9
Spreadsheets (Excel)	04-05	16.5	17.5	62.9
	05-06	24.9	19.5	53.2
Authoring (e.g., html)	04-05	11.4	9.5	75.3
	05-06	15.9	11.0	70.1
MS One Note	04-05	7.2	6.1	83.4
	05-06	9.8	6.3	80.9
<i>Squeak</i>	04-05	7.1	4.4	85.1
	05-06	7.8	5.7	83.6
<i>Ready, Set, Go!</i>	04-05	5.3	4.3	87.2
	05-06	7.4	4.7	85.2

Note. Item percentages may not total 100% because of missing data.

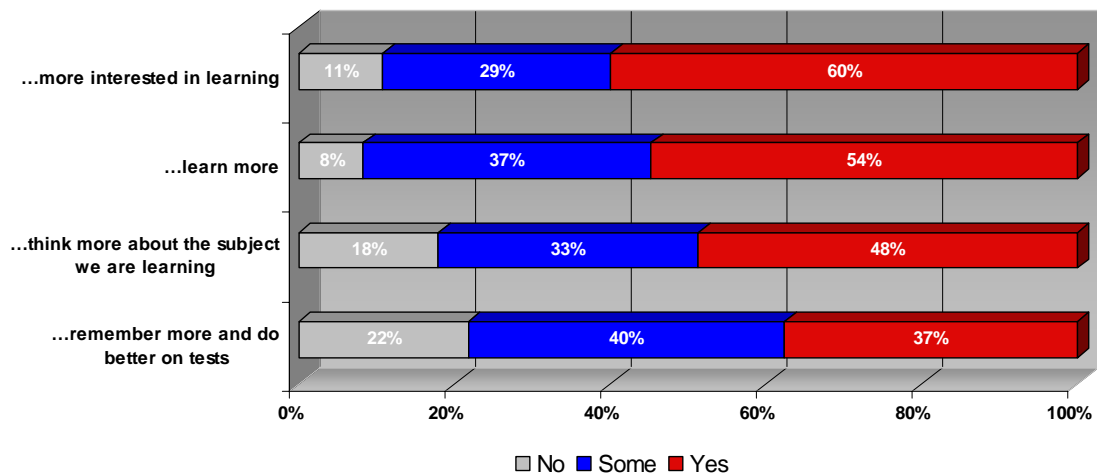


Figure 6. Student Survey: Impact of Using Laptops on Learning

FTL Teacher Technology Questionnaire (FTL-TTQ)

The FTL-TTQ was completed by total of 380 FTL teachers from 77 schools. The FTL results and national norms ($N = 5,542$) for the TTQ are presented in Table 15. Overall, the FTL teacher responses were significantly more positive on four of the five TTQ categories: Impact on Classroom Instruction ($ES = +0.42$); Impact on Students ($ES = +0.35$); Teacher Readiness to Integrate Technology ($ES = +0.36$); and Technical Support ($ES = +0.29$). Specifically, the FTL teachers indicated that laptop use had a positive impact student learning and achievement (FTL $M = 4.17$) and had increased the level of student interactions and/or collaborations (FTL $M = 4.15$). The teachers had the highest overall level of agreement that most of their students could capably use the FTL laptops at an age-appropriate level (FTL $M = 4.24$). FTL teachers were also in strong agreement that they routinely integrated use of the laptops into their instruction (FTL $M = 3.87$) and that their teaching was more student-centered (FTL $M = 3.85$) and more interactive (FTL $M = 3.88$) when laptops were used.

Strikingly, in comparison to national norms, the FTL teachers showed significantly greater confidence that they knew how to *meaningfully* integrate laptop use into lessons (FTL $M = 4.11$; Norm $M = 3.74$, $ES = +0.45$) and align use of the laptops with curriculum standards (FTL $M = 4.04$; Norm $M = 3.65$, $ES = +0.48$). In addition, the FTL teachers were in greater agreement that *their* computer skills were adequate to conduct lessons that had students using laptop computers (FTL $M = 4.13$; Norm $M = 3.82$, $ES = +0.37$).

When FTL teachers were asked to respond to items regarding the effectiveness of FTL Lead Teachers, results revealed general agreement ($M = 4.05$) that Lead Teachers had been a valuable asset to their school's FTL program. There was moderate teacher agreement that they frequently participated in professional development (PD) provided by their Lead Teacher or Super Coach ($M = 3.53$) or that the PD had helped teachers to improve integration lessons ($M = 3.60$) or to more frequently integrate use of laptops ($M = 3.54$).

TABLE 15. FTL TTQ: FTL vs. National Norm Significant Differences

2004-2005 FTL Teachers $n = 279$; National Norms $N = 5,542$
 2005-2006 FTL Teachers $n = 380$; National Norms $N = 5,542$

Category and Related TTQ Items		FTL Mean	FTL SD	National Norms	$t(274)$	p	ES
Impact on Classroom Instruction							
My teaching is more student-centered when FTL laptops are integrated into the lessons.	04-05	3.96	0.95	3.57	6.76	.001**	0.41
	05-06	3.85	0.94	3.54	6.41	.001**	0.33
I routinely integrate the use of FTL laptops into my instruction.	04-05	3.81	1.05	3.50	4.96	.001**	0.30
	05-06	3.87	1.05	3.43	8.24	.001**	0.42
The FTL laptop program has changed classroom learning activities in a very positive way.	04-05	4.20	0.88	3.90	5.74	.001**	0.34
	05-06	4.13	0.89	3.86	5.83	.001**	0.30
My teaching is more interactive when the FTL laptops are integrated into the lessons.	04-05	3.93	0.90	3.61	5.81	.001**	0.36
	05-06	3.88	0.94	3.59	5.88	.001**	0.30
Overall	04-05	3.98	0.80	3.65	6.81	.001**	0.41
	05-06	3.94	0.79	3.60	8.18	.001**	0.42
Impact on Students							
The use of FTL laptops has increased the level of student interaction and/or collaboration.	04-05	4.26	0.85	3.93	6.39	.001**	0.39
	05-06	4.15	0.94	3.88	5.46	.001**	0.28
The integration of the FTL laptops has positively impacted student learning and achievement.	04-05	4.30	0.85	3.97	6.34	.001**	0.39
	05-06	4.17	0.90	3.92	5.47	.001**	0.28
Most of my students can capably use the FTL laptops at an age-appropriate level.	04-05	4.21	0.83	4.00	4.14	.001**	0.25
	05-06	4.24	0.80	3.95	7.03	.001**	0.36
The use of the FTL laptops has improved the quality of student work.	04-05	3.96	0.87	3.59	7.07	.001**	0.43
	05-06	3.87	0.99	3.56	6.06	.001**	0.31
Overall	04-05	4.18	0.72	3.88	6.97	.001**	0.42
	05-06	4.11	0.78	3.83	6.89	.001**	0.35
Teacher Readiness to Integrate Technology							
I know how to meaningfully integrate the laptops into lessons.	04-05	4.01	0.89	3.78	4.21	.001**	0.26
	05-06	4.11	0.82	3.74	8.83	.001**	0.45
I am able to align use of the FTL laptops with my district's standards-based curriculum.	04-05	3.99	0.89	3.72	4.96	.001**	0.30
	05-06	4.04	0.82	3.65	9.29	.001**	0.48
I have received adequate training to incorporate the FTL laptops into my instruction.	04-05	3.50	1.09	3.78	-4.26	.001**	-0.26
	05-06	3.67	1.05	3.72	-0.97	.33 ^{NS}	n/a
My computer skills are adequate to conduct classes that have students using the FTL laptops.	04-05	4.07	0.91	3.85	4.08	.001**	0.24
	05-06	4.13	0.84	3.82	7.23	.001**	0.37
Overall	04-05	3.89	0.77	3.79	2.17	.031*	0.13
	05-06	3.99	0.72	3.73	7.01	.001**	0.36
Overall Support for Technology in the School							
Parents/Caregivers and community members support our school's FTL program	04-05	3.93	0.88	3.84	1.71	.089 ^{NS}	n/a
	05-06	3.88	0.87	3.80	1.70	.08 ^{NS}	n/a
Teachers receive adequate administrative support to integrate the FTL laptops into classroom practices.	04-05	3.77	1.12	3.94	-2.56	.011*	-0.15
	05-06	3.81	0.97	3.90	-1.75	.08 ^{NS}	n/a
Our school has a well-developed technology plan that guides all technology integration efforts.	04-05	3.31	1.06	3.76	-7.03	.001**	-0.42
	05-06	3.41	0.97	3.67	-5.17	.001**	-0.27
The FTL teachers in this school are generally supportive of the FTL laptop program.	04-05	4.25	0.80	3.90	7.20	.001**	0.44
	05-06	4.19	0.77	3.85	8.66	.001**	0.44
Overall	04-05	3.81	0.74	3.86	-1.03	.306 ^{NS}	n/a
	05-06	3.82	0.70	3.80	0.63	.52 ^{NS}	n/a

Table 15 continued

Technical Support							
Most of our FTL laptops are kept in good working condition.	04-05	4.41	0.77	3.95	10.06	.001**	0.60
	05-06	4.24	0.72	3.91	9.05	.001**	0.46
I can readily obtain answers to technology-related questions.	04-05	3.76	1.04	4.03	-4.29	.001**	-0.26
	05-06	4.02	0.86	4.00	0.41	.67 ^{NS}	n/a
My students have adequate access to up-to-date technology resources.	04-05	4.08	0.91	3.78	5.48	.001**	0.33
	05-06	4.1	0.89	3.70	8.66	.001**	0.44
Materials (e.g., software, printer supplies) for classroom use of the FTL laptops are readily available.	04-05	3.51	1.22	3.70	-2.59	.010**	-0.16
	05-06	3.68	1.08	3.63	0.91	.36 ^{NS}	n/a
Overall	04-05	3.94	0.77	3.86	1.74	.083 ^{NS}	n/a
	05-06	4.01	0.67	3.81	5.72	.001**	0.29
Lead Teacher Effectiveness							
I have frequently participated in professional development that was planned by or provided by my Lead Teacher and/or Super Coach.	04-05	3.57	1.12				
	05-06	3.53	1.10	NA	NA	NA	NA
I more frequently integrate technology into my instruction as a result of participating in professional development planned or provided by my Lead Teacher and/or Super Coach.	04-05	3.66	1.07				
	05-06	3.54	1.10	NA	NA	NA	NA
The quality of my technology integration lessons has improved as a result of participating in professional development planned or provided by my Lead Teacher and/or Super Coach.	04-05	3.66	1.07				
	05-06	3.60	1.03	NA	NA	NA	NA
Overall, my Lead Teacher has been a valuable asset to our school's FTL laptop program.	04-05	4.09	0.95				
	05-06	4.05	0.99	NA	NA	NA	NA
Overall	04-05	3.74	0.90				
	05-06	3.68	0.93	NA	NA	NA	NA

Scale: 1 = Strongly Disagree; 5 = Strongly Agree

* p < .05 , **p < .01, NS = No significant differences, Red Text = Norm significantly higher than FTL

FTL Lead Teacher Questionnaire (FTL-LT)

A total of 75 FTL Lead Teachers from 63 schools completed the on-line FTL Lead Teacher Questionnaire. The results are presented in Table 16. Not surprisingly, nearly all (96.0%) of the Lead Teachers agreed that the FTL program had a positive impact on students' ability and comfort level with technology. However, even more importantly, there was strong agreement that use of the laptops had increased student motivation to learn (90.7%), increased teacher use of student-centered learning in the classroom (89.3%), and increased the student-to-teacher interactions (82.7%). Nearly 75% (74.7%) indicated that FTL professional development had been effective, while 57.3% of the Lead Teachers agreed that they provided teacher training to the FTL teachers in their school. Fewer agreed that administrators participated in FTL training for teachers (34.7%), or that the community (28.0%) or parents (10.7%) were involved in the FTL program.

TABLE 16. FTL Lead Teacher Survey2004-2005 *n* = 632005-2006 *n* = 75

Items sorted by highest level of agreement		Percentage of Responses		
		Strongly Agree & Agree	Neutral	Strongly Disagree and Disagree
FTL has had a positive impact on students' ability and comfort levels with technology.	04-05	90.5	1.6	1.6
	05-06	96.0	2.7	1.3
Use of the FTL laptops has increased student motivation to learn.	04-05	85.7	6.3	1.6
	05-06	90.7	8.0	1.3
Use of laptops in FTL classes has increased teacher use of student-centered learning.	04-05	84.1	7.9	1.6
	05-06	89.3	10.7	0.0
Our principal is very supportive of the FTL program.	04-05	84.1	6.3	3.2
	05-06	89.3	9.3	1.3
Use of the FTL laptops has increased student-to-teacher interactions.	04-05	84.1	4.8	4.8
	05-06	82.7	12.0	5.3
I provided ongoing support to FTL teachers.	04-05	82.5	7.9	3.2
	05-06	78.7	17.3	2.7
FTL teachers are very supportive of the FTL program.	04-05	81.0	7.9	4.8
	05-06	77.3	18.7	1.3
FTL teachers' ability and comfort levels with technology have increased due to FTL.	04-05	77.8	12.7	3.2
	05-06	89.3	9.3	1.3
Our district is very supportive of the FTL program.	04-05	77.8	7.9	7.9
	05-06	85.3	9.3	4.0
Use of the FTL laptops has increased student-to-student interactions.	04-05	73.0	14.3	6.3
	05-06	76.0	18.7	5.3
Student learning and achievement has increased as a result of using FTL laptops.	04-05	71.4	20.6	1.6
	05-06	80.0	18.7	1.3
FTL sponsored professional development has been effective.	04-05	71.4	14.3	6.3
	05-06	74.7	17.3	8.0
Our parents are very supportive of the FTL program.	04-05	68.3	20.6	4.8
	05-06	72.0	26.7	1.3
I participated in professional development provided by our Super Coach.	04-05	63.5	11.1	19.0
	05-06	50.7	16.0	32.0
Collaborations among FTL teachers have increased due to the FTL program.	04-05	55.6	33.3	4.8
	05-06	74.7	18.7	5.3
Use of the FTL laptops has decreased classroom discipline problems.	04-05	55.6	27.0	11.1
	05-06	65.3	26.7	8.0
Administrators in our school model the use of technology.	04-05	54.0	17.5	22.2
	05-06	65.3	22.7	12.0
Administrators in our school are very involved with FTL.	04-05	49.2	23.8	19.0
	05-06	56.0	29.3	14.7
Our administrators have participated in FTL professional development for administrators.	04-05	47.6	20.6	23.8
	05-06	37.3	40.0	21.3
I provided professional development workshops for our FTL teachers.	04-05	46.0	25.4	22.2
	05-06	57.3	22.7	18.7
Our teachers participated in professional development provided by our Super Coach.	04-05	42.9	11.1	39.7
	05-06	33.3	17.3	45.3
Our administrators have participated in FTL professional development for teachers.	04-05	34.9	19.0	38.1
	05-06	34.7	32.0	33.3
Our community members are involved and supportive of FTL.	04-05	30.2	41.3	22.2
	05-06	28.0	37.3	33.3
Our parents are very involved with FTL.	04-05	20.6	36.5	36.5
	05-06	10.7	54.7	34.7

Note. Item percentages may not total 100% because of missing input from some respondents.

FTL Parent Survey

A total of 1,241 parents/guardians of children in FTL classrooms completed the paper-based survey. The parents represented 90 of the 195 (46.2%) schools implementing FTL. Overall, parent responses were positive and supportive of the advantages of their children using laptops at school (Table 17). Almost all (90.9%) parents agreed that using laptop computers had improved their child's research skills "a lot" (61.8%) or "some" (29.1%). While approximately 80% indicated that laptop use had increased their child's interest ("a lot" = 36.5%; "some" = 43.3%) and achievement in school ("a lot" = 31.1%; "some" = 45.9%). There was slightly less overall agreement (69.3%) that using laptops had improved their child's writing skills ("a lot" = 26.8%; "some" = 42.5%).

Less than 20% of the parents (17.8%) had participated in FTL-sponsored activities. The most commonly attended activity was an open house (67.4%), whereas nearly 23% (22.6%) of the parents had participated in computer training. Of the parents who responded to the "helpfulness" of the activities, most indicated that they were "very helpful."

TABLE 17. FTL Parent Survey

2004-2005 parent survey not administered
2005-2006 $n = 1,241$

To what degree has using a laptop computer at school changed you child's:	Percent Not Sure	Percent Not at All	Percent Some	Percent A Lot
Research skills	4.2	4.3	29.1	61.8
Involvement in project-type school work	6.6	7.0	34.6	50.4
Interest in school?	8.3	10.6	43.3	36.5
Achievement in school?	9.1	12.5	45.9	31.1
Writing skills	10.5	18.7	42.5	26.8
Ability to work with other students	14.4	17.5	40.0	26.7
Have you participated in any parent activities supported by the laptop program?		Yes	17.8	
		No	0.1	
		Percentage of activity participation		
		Open house	67.4	
If yes, please indicate the type of activity (mark all that apply)		Computer training	22.6	
		Technology fair	4.5	
		Other	36.7	
How helpful was the activity?		Very helpful	12.5	
		Somewhat helpful	7.3	
		Not helpful	0.6	
		Did not attend any activities	15.6	

Note: Item percentages may not total 100% because of missing input from some respondents

Student Performance-Based Assessment Results

The Problem-Solving and Technology Tasks were administered to examine the impact of the FTL program on 6th grade students' ability to solve problems and to generate computer products that reflect problem-solving solutions according to ISTE NETS for students. The performance-based assessments were administered to 6th grade FTL and Control students who were strategically matched on the basis of school size; school local (urban, suburban, rural); ethnicity (percent minority); SES indicator (percent free and reduced-price lunch); and availability of control school computer access (computer labs) for assessment administration. Results for each assessment are presented below.

Student Problem-Solving Task

As described earlier, the Student Problem-Solving Task was assessed with a rubric comprised of seven components, each rated on a three-level scale with "3" representing the highest level of response (see Appendix). The participants consisted of 32 6th grade students, 11 in the FTL group and 21 in the Control group. Across all problem-solving areas, the FTL means scores were higher or equal to those of the control group (Table 18). The FTL students exhibited the highest ability in demonstrating understanding of the problem ($M = 1.50$), identifying what is known about the problem ($M = 1.36$) and what needs to be known about the problem ($M = 1.23$). In contrast, the control group's highest level of performance was with regard to understanding the problem ($M = 1.14$) and in describing the use of collaborative learning in the solution ($M = 1.14$). The lowest level of ability for both the FTL and Control groups was seen in three areas: how to present the findings (FTL $M = 1.05$, Control $M = 1.02$), determining how the data needs to be manipulated to solve the problem (FTL $M = 1.05$, Control $M = 1.00$), and interestingly, describing how technology would be used to solve the problem (FTL $M = 1.00$, Control $M = 1.00$).

TABLE 18. Student* Problem-Solving Task: Frequencies and Means

Items by Group	0		1		1.5		2		2.5		3		Overall		
	N	%	N	%	N	%	N	%	N	%	N	%	n	M	SD
Understands Problem															
Program	0	0.0	4	36.4	3	27.3	4	36.4	0	0.0	0	0.0	11	1.50	0.45
Control	0	0.0	17	81.0	2	9.5	2	9.5	0	0.0	0	0.0	21	1.14	0.32
Identifies what is known about the problem															
Program	0	0.0	6	54.5	2	18.2	3	27.3	0	0.0	0	0.0	11	1.36	0.45
Control	0	0.0	19	90.5	0	0.0	2	9.5	0	0.0	0	0.0	21	1.10	0.30
Identifies what needs to be know to solve the problem															
Program	0	0.0	7	63.6	3	27.3	1	9.1	0	0.0	0	0.0	11	1.23	0.34
Control	0	0.0	19	90.5	2	9.5	0	0.0	0	0.0	0	0.0	21	1.05	0.15
Determine how the data needs to be manipulated to solve the problem															
Program	0	0.0	10	90.9	1	9.1	0	0.0	0	0.0	0	0.0	11	1.05	0.15
Control	0	0.0	21	100.0	0	0.0	0	0.0	0	0.0	0	0.0	21	1.00	0.00
Describes the use of technology															
Program	0	0.0	11	100.0	0	0.0	0	0.0	0	0.0	0	0.0	11	1.00	0.00
Control	0	0.0	21	100.0	0	0.0	0	0.0	0	0.0	0	0.0	21	1.00	0.00
Describes how to present findings															
Program	0	0.0	10	90.9	1	9.1	0	0.0	0	0.0	0	0.0	11	1.05	0.15
Control	0	0.0	20	95.2	1	4.8	0	0.0	0	0.0	0	0.0	21	1.02	0.11
Collaborative Learning															
Program	0	0.0	9	81.8	1	9.1	1	9.1	0	0.0	0	0.0	11	1.14	0.32
Control	0	0.0	18	85.7	0	0.0	3	14.3	0	0.0	0	0.0	21	1.14	0.36

*6th Grade students

Student Problem-Solving Task Inferential Results: FTL vs. Control. Preliminary analysis did not justify using MANOVA due to properties of the student problem solving task score distributions. Therefore, separate ANOVA were conducted to compare FTL Program vs. Control students' problem solving scores across seven components of the problem-solving rubric. Results of the analyses are seen in Table 19 and Figure 7. FTL program students exhibited significantly higher ($ES = +0.97$) ability in demonstrating understanding of the problem and in identifying what needs to be known to solve the problem ($ES = +0.77$). These effect sizes can be considered as representing a strong and meaningful educational effect.

TABLE 19: Student Problem-Solving Task: Significant Differences Between FTL and Control

Problem-Solving Rubric items	FTL (n = 11)		Control (n = 21)		F(1,30)	p	ES
	M	SD	M	SD			
Understands problem	1.50	0.48	1.14	0.32	6.785	0.014*	0.97
Identifies what needs to be known to solve the problem	1.23	0.34	1.05	0.15	4.277	0.047*	0.77

* $p < 0.05$

Problem-Solving: Significant FTL vs. Control Differences

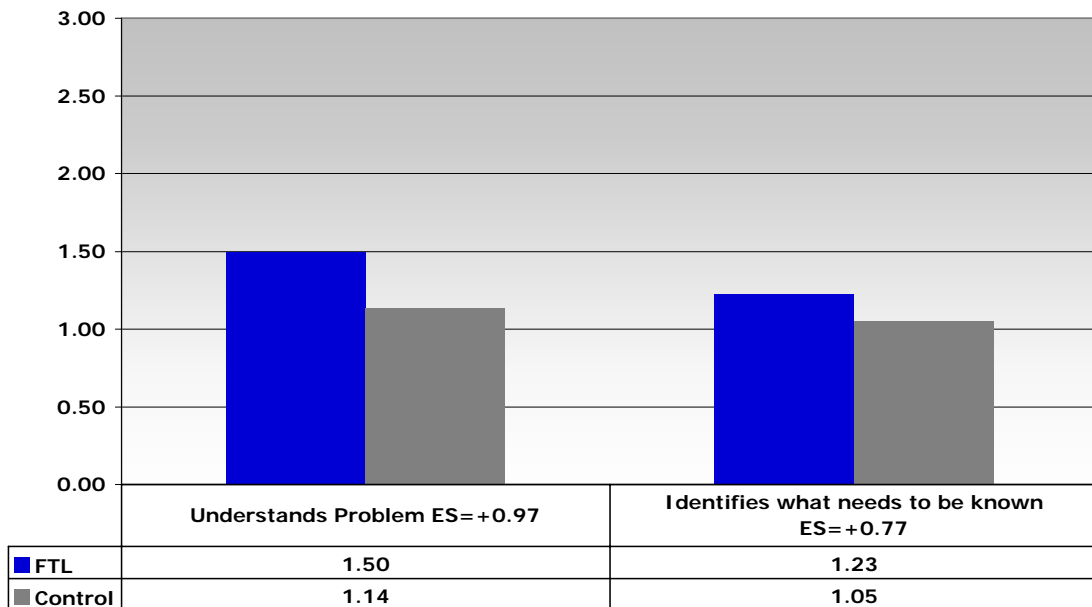


Figure 6. Student Problem-Solving Assessment: Significant FTL vs. Control Differences

Student Technology Task

As described earlier, each component in the Student Technology Task was assessed with a three-level rubric scale regarding the degree to which the element was completed as described (“2” = completed; “1” = partially completed; “0” = not completed). Results for the Student Technology Tasks are presented in the following tables: Spreadsheets (Table 20); Presentation (Table 21); and Internet (Table 22). As seen in Table 20, FTL program students exhibited a slightly higher degree of proficiency with spreadsheets than Control students. However the overall performance for both groups was below average (FTL $M = 0.16$; Control $M = 0.09$).

TABLE 20. SPREADSHEETS: Student* Technology Task Frequencies and Means

Spreadsheets	0		1		2		Overall			
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	<i>n</i>	<i>M</i>	<i>SD</i>	
Enter numerical data into spreadsheet cells?										
FTL Program	20	74.1	0	0.0	7	25.9	27	0.52	0.89	
Control	21	87.5	1	4.2	2	8.3	24	0.21	0.59	
Place column names into correct cells?										
FTL Program	20	74.1	2	7.4	5	18.5	27	0.44	0.80	
Control	21	87.5	1	4.2	2	8.3	24	0.21	0.59	
Place row names in correct cells?										
FTL Program	20	74.1	3	11.1	4	14.8	27	0.41	0.75	
Control	21	87.5	1	4.2	2	8.3	24	0.21	0.59	
Use a spreadsheet formula to calculate the average of a column of numbers?										
FTL Program	25	92.6	0	0.0	2	7.4	27	0.15	0.53	
Control	24	100.0	0	0.0	0	0.0	24	0.00	0.00	
Create a chart?										
FTL Program	26	96.3	1	3.7	0	0.0	27	0.04	0.19	
Control	23	95.8	1	4.2	0	0.0	24	0.04	0.20	
Change the color of columns in a column chart?										
FTL Program	27	100.0	0	0.0	0	0.0	27	0.00	0.00	
Control	23	95.8	0	0.0	1	4.2	24	0.08	0.41	
Add a title to a chart?										
FTL Program	27	100.0	0	0.0	0	0.0	27	0.00	0.00	
Control	23	95.8	1	4.2	0	0.0	24	0.04	0.20	
Add a title to a chart axis?										
FTL Program	27	100.0	0	0.0	0	0.0	27	0.00	0.00	
Control	23	95.8	1	4.2	0	0.0	24	0.04	0.20	
Change the range of the Y-axis scale?										
FTL Program	27	100.0	0	0.0	0	0.0	27	0.00	0.00	
Control	24	100.0	0	0.0	0	0.0	24	0.00	0.00	
Change location of the legend?										
FTL Program	27	100.0	0	0.0	0	0.0	27	0.00	0.00	
Control	23	95.8	0	0.0	1	4.2	24	0.08	0.41	
*6 TH grade							OVERALL	<i>n</i>	<i>M</i>	<i>SD</i>
							FTL Program	27	0.16	0.28
							Control	24	0.09	0.26

The FTL students demonstrated a much greater degree of expertise with *PowerPoint* software (Table 21), as the overall mean scores for each presentation task were higher for FTL student performance products as compared to the presentation products created by the Control students. Specifically, the FTL mean scores ranged from $M = 1.78$ to $M = 0.04$, whereas the range for Control students was $M = 1.00$ to $M = 0.00$.

TABLE 21. PRESENTATION: Student* Technology Task Frequencies and Means

Presentation	0		1		2		Overall			
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	<i>n</i>	<i>M</i>	<i>SD</i>	
Add a title to a slide?										
FTL Program	4	14.8	0	0.0	23	85.2	27	1.70	0.72	
Control	12	50.0	0	0.0	12	50.0	24	1.00	1.02	
Add a slide to a presentation?										
FTL Program	3	11.1	0	0.0	24	88.9	27	1.78	0.64	
Control	12	50.0	0	0.0	12	50.0	24	1.00	1.02	
Insert a clipart image or photograph to a slide?										
FTL Program	8	29.6	0	0.0	19	70.4	27	1.41	0.93	
Control	18	75.0	0	0.0	6	25.0	24	0.50	0.88	
Change the font of a text within a presentation?										
FTL Program	12	44.4	0	0.0	15	55.6	27	1.11	1.01	
Control	15	62.5	0	0.0	9	37.5	24	0.75	0.99	
Change the size of text within a presentation?										
FTL Program	19	70.4	0	0.0	8	29.6	27	0.59	0.93	
Control	19	79.2	0	0.0	5	20.8	24	0.42	0.83	
Bold text within a presentation?										
FTL Program	15	55.6	0	0.0	12	44.4	27	0.89	1.01	
Control	19	79.2	0	0.0	5	20.8	24	0.42	0.83	
Insert a Microsoft Excel spreadsheet chart onto a slide?										
FTL Program	26	96.3	1	3.7	0	0.0	27	0.04	0.19	
Control	24	100.0	0	0.0	0	0.0	24	0.00	0.00	
Arrange content on a slide as a bullet list?										
FTL Program	5	18.5	2	7.4	20	74.1	27	1.56	0.80	
Control	14	58.3	1	4.2	9	37.5	24	0.79	0.98	
Add a design template to a presentation?										
FTL Program	16	59.3	0	0.0	11	40.7	27	0.81	1.00	
Control	19	79.2	1	4.2	4	16.7	24	0.37	0.77	
Select and use relevant images?										
FTL Program	8	29.6	0	0.0	19	70.4	27	1.41	0.93	
Control	19	79.2	0	0.0	5	20.8	24	0.42	0.83	
*6 th grade							OVERALL	<i>n</i>	<i>M</i>	<i>SD</i>
							FTL Program	27	1.13	0.52
							Control	24	0.57	0.50

The greatest level of expertise and skill demonstrated by the FTL students was in their use of the Internet (Table 22). The overall mean scores for FTL student performance as compared to the Control student performance is striking: FTL $M = 1.58$ vs. Control $M = 0.42$.

TABLE 22. INTERNET: Student* Technology Task Frequencies and Means

Internet	0		1		2		Overall			
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	<i>n</i>	<i>M</i>	<i>SD</i>	
Navigate to a web site given a specific web address (URL)?										
FTL Program	5	18.5	0	0.0	22	81.5	27	1.63	0.79	
Control	18	75.0	0	0.0	6	25.0	24	0.50	0.88	
Obtain an image from a website and use it in a document?										
FTL Program	7	25.9	0	0.0	20	74.1	27	1.48	0.89	
Control	20	83.3	0	0.0	4	16.7	24	0.33	0.76	
*6 th grade							OVERALL	<i>n</i>	<i>M</i>	<i>SD</i>
							FTL Program	27	1.56	0.80
							Control	24	0.42	0.78

Student Technology Task Inferential Results: FTL vs. Control. A MANOVA comparing the FTL Program and Control student technology task scores yielded a highly significant difference (Hotellings T = 0.54, $F(3, 47) = 8.48$, $p = .001$). Follow-up analyses (Table 23 and Figure 8) showed overall significant advantages for the FTL Program group with regard to completing Presentation and Internet tasks. The effect sizes ranged from +1.02 to +1.44, thus indicating that the significant differences were very strong and educationally meaningful.

TABLE 23: Student Technology Task: Significant Differences Between FTL and Control

Overall	Hotellings T	F	Hypothesis df	Error df	Significance		
	0.541	8.479	3	47	0.001		
Technology Tasks	Program (n = 27)		Control (n = 24)		F(1, 49)	p	ES(d)
	M	SD	M	SD			
Spreadsheets	0.16	0.28	0.09	0.26	0.72	0.400	N/A
Presentation	1.13	0.52	0.57	0.59	13.11	0.001**	1.02
Internet	1.56	0.80	0.42	0.78	26.48	0.001**	1.44

** $p < .01$

Technology Tasks: Significant FTL vs. Control Differences

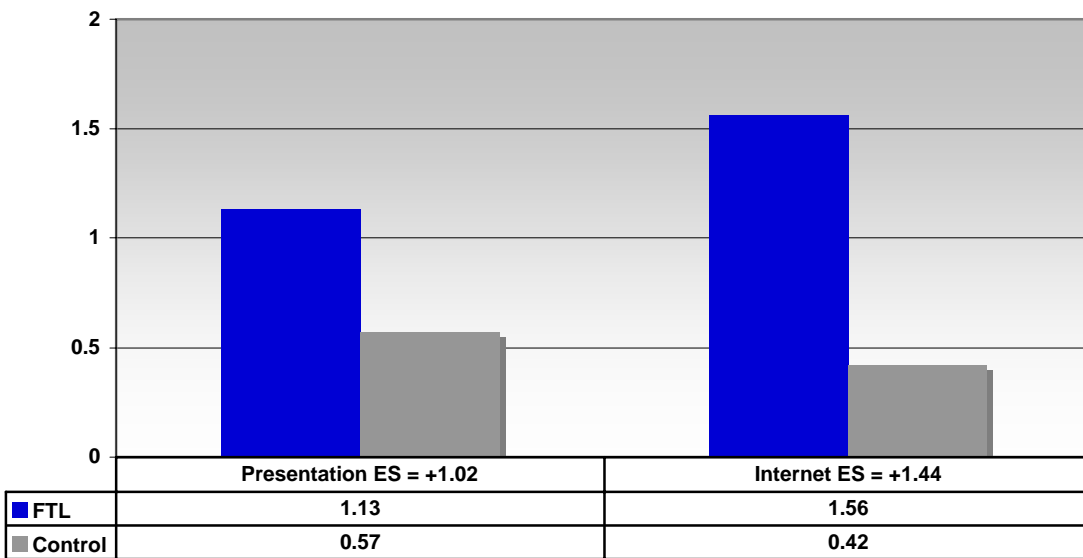


Figure 6. Student Problem-Solving Assessment: Significant FTL vs. Control Differences

Student Achievement Analysis Results

A series of 2x2 chi-square frequency analyses were conducted comparing FTL and comparison schools, to investigate the association between the program and students' achievement in four subjects: English, Math, Reading and Writing. For these subject areas, there were four levels of achievement: Level 1 (exceeded MI standards), Level 2 (met MI standards), Level 3 (at basic level), and Level 4 (apprentice) according to the Michigan Educational Assessment of Program (MEAP). Based on the differences among the levels, the proficiency level classifications were collapsed into two categories: meet or exceed standard (Level 1 and 2) and at basic or below standard (Level 3 and 4). The number of students in these two classifications was calculated and inserted into a 2 by 2 frequency table. The chi-square outcomes indicated that the student outcomes for one pair of schools were not significantly different (Table 24). Among the remaining seven pairs, four FTL schools outperformed their matched comparison schools in math (2 pairs) and writing (2 pairs). For the remaining three school pairs, the comparison schools outperformed the FTL schools in math (2 pairs), and in both English and writing (1 pair).

Table 24. FTL Student Achievement Analysis by School Pairs and Test Subjects

School Pairs	FTL Comparison				Chi Square	p
	Number Meeting or Exceeding Standard	Number At or Below Standard	Number Meeting or Exceeding Standard	Number At or Below Standard		
Pair 1						
English	123	105	90	68	0.41	.52
Math	83	140	79	80	5.94	.015**
Reading	136	92	99	59	0.38	.54
Writing	110	118	87	71	1.88	.17
Pair 2						
English	93	162	58	65	4.10	.043**
Math	75	183	26	96	2.58	.11
Reading	110	145	64	59	2.65	.10
Writing	85	170	54	69	4.15	.042**
Pair 3						
English	16	7	12	6	0.04	.84
Math	10	13	13	5	3.38	.07
Reading	17	6	16	2	1.45	.23
Writing	17	6	8	10	3.69	.05*
Pair 4						
English	19	5	56	19	0.20	.65
Math	21	4	47	28	3.91	.048*
Reading	20	4	61	14	0.05	.83
Writing	16	8	53	22	0.14	.71
Pair 5						
English	37	21	30	21	0.29	.59
Math	15	43	26	25	7.28	.007**
Reading	42	16	32	19	1.17	.28
Writing	30	28	20	31	1.71	.19
Pair 6						
English	14	2	32	7	0.24	.62
Math	14	2	22	16	4.44	.035*
Reading	14	2	32	7	0.24	.62
Writing	14	2	29	10	1.14	.29
Pair 7						
English	26	8	120	67	2.00	.16
Math	27	7	121	66	2.81	.09
Reading	25	9	125	62	0.59	.44
Writing	27	7	109	78	5.51	.02*
Pair 8						
English	22	9	43	21	0.14	.71
Math	21	10	35	29	1.46	.23
Reading	21	10	41	23	0.12	.73
Writing	21	10	37	27	0.86	.35

*FTL significantly higher than Control; **Control significantly higher than FTL

CONCLUSIONS

The conclusions of the present study are presented in association with each of the FTL program goals in the following section.

GOAL 1 *Enhance student learning and achievement in core academic subjects with an emphasis on developing the knowledge and skills requisite to the establishment of a 21st Century workforce in Michigan.*

The results of this evaluation suggest that FTL students have greater advantages than non-FTL students with regard to developing the knowledge and skills needed to achieve success in the 21st Century workforce and equal to or enhanced advantages for increased learning and achievement. FTL students as compared to control students exhibited greater ability to locate and utilize Internet resources and develop computer-based presentations. FTL students also demonstrated significantly higher problem-solving abilities than non-FTL students. Just as importantly, the majority of the FTL students agreed that use of the laptops had made them more interested in learning and would help them get better jobs in the future. Similarly, the FTL teachers agreed to a significantly higher degree than teachers represented by the national norms that laptop use had a positive impact on student learning and achievement. Additionally, observations showed that FTL students were engaged in meaningful computer learning activities significantly more than students represented in the national norms.

GOAL 2 *Provide greater access to equal educational opportunities statewide through ubiquitous access to technology.*

The Freedom to Learn program, as documented in this evaluation report, has made tremendous strides toward providing greater access to equal educational opportunities to students in FTL classrooms. This is evidenced by the program providing laptop computers to students in 195 schools and in data from over 5,700 FTL students who report that they are very glad that they get to use laptop computers and want to use them again next year. Nearly all students reported that using laptop computers increased their research skills, made schoolwork easier and made them learn more and do better on tests. Similarly, the FTL teachers reported that having laptops had increased their use of student-centered practices, increased student motivation and learning, and improved student computer skills as well as their own personal technology skills. Additional evidence was revealed

when examining data from random visits to 599 FTL classrooms. For example, FTL vs. national norm classroom observation data show that computer activities in FTL lessons were significantly more meaningful and that FTL students more frequently used the laptops as learning tools. Collectively, these data present triangulated evidence that the 2005-2006 FTL program implementation did provide greater access to equal educational opportunities statewide through ubiquitous access to technology.

GOAL 3 *Foster effective use of the wireless technology through systematic professional development for teachers, administrators and staff.*

There was moderate agreement among the 380 FTL teachers that they had received adequate training to incorporate laptops into their instruction. There was also moderate agreement that, as a result of the FTL professional development (PD), the quality of laptop lessons was improved and the teachers more frequently integrated the laptops into their instruction. Evidence of PD effectiveness was seen during classroom observations in which FTL teachers implemented lessons that were significantly more meaningful, more student-centered, and more often used laptops as tools for learning than did teachers represented by CREP's national norms. The results suggest that the PD focus and approach for preparing teachers to integrate effective use of laptops into their instruction is successful. However, the data also suggest that the frequency and amount of professional development needs to be increased. According to Lead Teacher surveys from 63 schools, administrator participation in FTL professional development occurred less frequently during the second year of implementation, although many administrators modeled the use of technology and were involved in the FTL program.

GOAL 4 *Empower parents and caregivers with the tools to become more involved in their children's education.*

Direct information from over 1,200 parents/caregivers representing approximately half of the FTL schools revealed that parents were positive and supportive of their children using laptops at school. Almost all parents agreed that laptop use had improved their child's research skills and increased their interest and achievement in school. However, very few of the parents reported participation in FTL-sponsored computer training. Similar results are seen in survey responses from FTL teachers and Lead Teachers who generally agreed that parents supported the FTL program, while Lead Teacher data suggested that parental involvement with FTL was minimal.

GOAL 5 *Support innovative structural changes in participating schools and sharing of best practices through the creation of human networks among Program participants.*

Data from this evaluation reveal that the FTL program enabled and supported participating schools to achieve significantly more innovative structural changes during 2005-2006 than schools represented in the national norms. This was evidenced by observing significantly more student-centered activities that engaged students in independent research through the use of laptops as tools. It was also evidenced in FTL students demonstrating significantly higher problem solving, Internet and presentation software ability than matched-control students. Additional evidence is seen in FTL teachers being significantly more confident about meaningfully integrating technology than national norm teachers. Collectively, data from observations, surveys, performance-based assessments, and achievement analyses suggest that the two-year FTL program has been a catalyst for innovative technology interventions that have improved educational opportunities for Michigan's students, while the data also reveal room for continued growth and improvement.

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Appendix

Student Performance-Based Assessment Materials for the
Problem-Solving Task and the Technology Task

Student Performance Assessment Teacher Information Sheet

Thank you for participating in the student performance assessment in which your students will use computers to complete an assigned task. Below is a checklist for administering the assessment.

BEFORE THE STUDY

- ___ Check Materials to ensure that you have:
 - ___ One Parent/Guardian Consent Form per student
 - ___ One Student Packet per student
- ___ Schedule 45-minutes for the assessment sometime prior to [date]
- ___ Send Parent/Guardian Consent Forms home with each participating student.
- ___ Tell students they will need to bring a book to read after they finish the task.
- ___ Ensure that one computer is available for each student to individually complete the task.
- ___ Ensure that each computer has a *working* copy of:
 - ___ Microsoft Word
 - ___ Microsoft Excel
 - ___ Microsoft PowerPoint
 - ___ Internet browser
- ___ Ensure that each computer can send documents to a working printer.
- ___ Ensure that each computer can save documents to a floppy disk or server (If using a server, please save all student documents to one disk that is labeled "All student documents" – and return disk with completed materials.)

DAY OF THE STUDY

- ___ Ensure that enough paper is available to print 3 to 5 pages per student
- ___ Make sure each student has a book to read if they finish the task early.

DURING THE STUDY

- ___ Ensure that each student has a signed Parent/Guardian Consent Form
- ___ Read "Student Instructions" to your class
- ___ Distribute a packet to each student.
- ___ Remind students to frequently save their work

AFTER THE STUDY

- ___ Return all Materials to CREP in the postage-paid envelope – by [date]

<i>Questions??</i> If you have questions, please call Dan Strahl at 1-866-670-6147
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Thank you!

Student Problem-Solving Assessment

Teacher Instructions

Teacher:

Read to Students **BEFORE** they open their Student Packet envelopes.

Our class was selected to participate in a study investigating how well 6th grade students can think about and solve common problems in our society. In this task you will use the computer to describe how you would help a city park get people to recycle more soft drink cans.

While working, please:

- Do not talk to other students.
- Do NOT include your name on any of the materials or your computer documents.
- When you finish, please quietly read your book.

I cannot help you with the problem, but can help if you have trouble:

- Finding the software
- Saving your work to the disk
- Printing your work

Please open your packets and carefully follow the step-by-step instructions - It is very important that you do your BEST work.

Student Problem-Solving Task

ID # _____

~ Welcome ~

Hope you enjoy solving the following problem!

OVERVIEW

We are interested in knowing how well 6th grade students can think about and solve common problems that occur in our society. In this task you will tell us how you would solve a problem regarding recycling soft drink cans found in park trash bins. Before beginning the task, please complete the following survey.

SURVEY

Please answer each question by circling the appropriate answer.

Word Processing

How much experience do you have using <i>Microsoft (MS) Word</i> ?	None	Some	A lot
How often do you use <i>MS Word</i> ?	Never	Once in a while	A lot
What is your skill level with <i>MS Word</i> ?	None	Moderate	Excellent

PROBLEM-SOLVING TASK

Follow these steps to complete this task. It is very important that you do your **very best** work.

1. Open *MS Word*
2. Save the document on your floppy disk using the following name:
problemID# (e.g., problem1247)
3. Title your paper, "Recycling Cans at the Park"
4. In your word processing document, describe **how** you would solve the problem found on Page 2. Remember to carefully read and respond to all of the instructions.
5. Frequently save your work to your floppy disk.
6. When your solution is complete, save the final document and print a copy.
7. Place ALL materials in the envelope: these sheets, your printed copy, and your floppy disk.
8. If you finish early, quietly read your book.

Note: Use only your ID# on your answer. Do NOT add your name to the document.

Thank you!

THE PROBLEM: RECYCLING CANS AT THE PARK



There are several soft drink machines at the city parks. When you buy a drink, it costs 10 cents extra for the can. The 10 cents is for a deposit that you get when you take the can back for recycling. The park managers have found a large number of cans in the parks' trashcans. The City Parks Commission wants to have more people recycle their cans. They have asked you to help them study this problem *all summer*.

How can the parks get people to recycle soft drink cans?

Please tell us *how* you would solve this problem. Describe with details what you would do. Describe the materials and resources you will use. Would you work with others? If so, describe how you would work with them.



Tell us how you will determine:

- Which park has the largest number of cans in the trash?
- How much money does the vending company keep from cans that are never turned in for a deposit?
- What are the benefits of recycling - does it really make a difference in saving natural resources?
- What might you do to encourage people to recycle the cans rather than putting them in the trash? (List as many ideas as you can.)
- How could you determine if increasing the deposit amount would increase the return of cans to collect the deposit?
- How would you present the results to the Parks Commission?

Remember to frequently save your work.

When finished, return to #7 on the Page 1

Student Problem-Solving Rubric

STUDENT ID# _____

ASSESSED BY: _____

Directions: Circle the rating that best represents the student's level of performance for each component.

Component/Rating	Level 1	Level 2	Level 3
Understands problem	The overall problem-solving approach demonstrates a very limited understanding of the problem.	The overall problem-solving approach somewhat demonstrates a general understanding of the problem.	The overall problem-solving approach strongly demonstrates clear understanding of the problem.
Identifies what is known about the problem	Response provides a very limited or no description of what is known.	Response provides an incomplete description of what is known	Response provides a complete and detailed list of what is known about problem
Identifies what needs to be known to solve the problem	Response provides no or a very limited relationship between what needs to be known (data) and problem	Response provides some reasoning as to how data or what needs to be known are related to problem-solving	Response provides developed rationale as to how data or what needs to be known are related to solving the problem
Determines how the data needs to be manipulated to solve the problem	Response does not address data manipulation	Response provides indication that data must be manipulated	Response describes specific ways of manipulating data to solve problem
Describes use of technology	Description of technology use is not included or very limited, e.g., the computer will be used to get information.	Response describes specific technology/software that will be used to solve problem, but only provides general tasks to be completed, e.g., the Internet will be used to find information.	Response describes specific technology/software and specific tasks that will be used to solve problem, e.g., the Internet will be used to find information about recycling.
Describes how to present findings	Response provides no or very limited detail as to how results will be presented	Response provides a general description of how results will be presented	Response describes details of how and what results will be presented
Collaborative Learning	Response includes no mention of collaboration.	Response describes limited collaboration, mostly for sharing information or obtaining help	Response describes a collaborative orientation with assigned responsibilities and extensive interactions with partners

Student Technology Assessment

Teacher Instructions

Teacher:

Read to Students **BEFORE** they open their Student Packet envelopes.

Our class was selected to participate in a study investigating how well 6th grade students can use Excel and PowerPoint. The information will help teachers better prepare you and other students to use computers in the workforce.

While working, please:

- Do not talk to other students.
- Do NOT include your name on any of the materials or your computer documents.
- When you finish, please quietly read your book.

I cannot help you with using Excel or PowerPoint, but can help if you have trouble:

- Finding the software
- Saving your work to the disk
- Printing your work

Please open your packets and carefully follow the step-by-step instructions - It is very important that you do your BEST work.

Student Technology Tasks

(Lowther & Marvin, 2004)

ID # _____

~ Welcome ~

Hope you enjoy the following Excel and PowerPoint tasks.

OVERVIEW

We are interested in knowing how well 6th grade students can use Excel and PowerPoint. The information will help teachers better prepare you to use computers for your future jobs. Before beginning these tasks, please complete the following survey.

SURVEY

Please answer each question by circling the appropriate answer.

Excel

How much experience do you have using Excel?	None	Some	A lot
How often do you use Excel software?	Never	Once in a while	A lot
What is your skill level with Excel?	None	Moderate	Excellent

PowerPoint

How much experience do you have using PowerPoint?	None	Some	A lot
How often do you use PowerPoint software?	Never	Once in a while	A lot
What is your skill level with PowerPoint?	None	Moderate	Excellent

TASKS

Follow these steps to complete the tasks. It is important that you do your **very best** work.

EXCEL TASK

- The 1st task uses Excel.
- Please complete as many of the Excel steps as you can.
- If you do not know how to use Excel, please go to the PowerPoint task.

POWERPOINT TASK

- The 2nd task uses PowerPoint.
- Please complete as many of the PowerPoint steps as you can.
- If you do not know how to use PowerPoint, please place all sheets in your envelope and quietly read your book until the others are finished.

Note: Use ONLY your ID# on each document. Do NOT add your name to the documents.

Thank you!

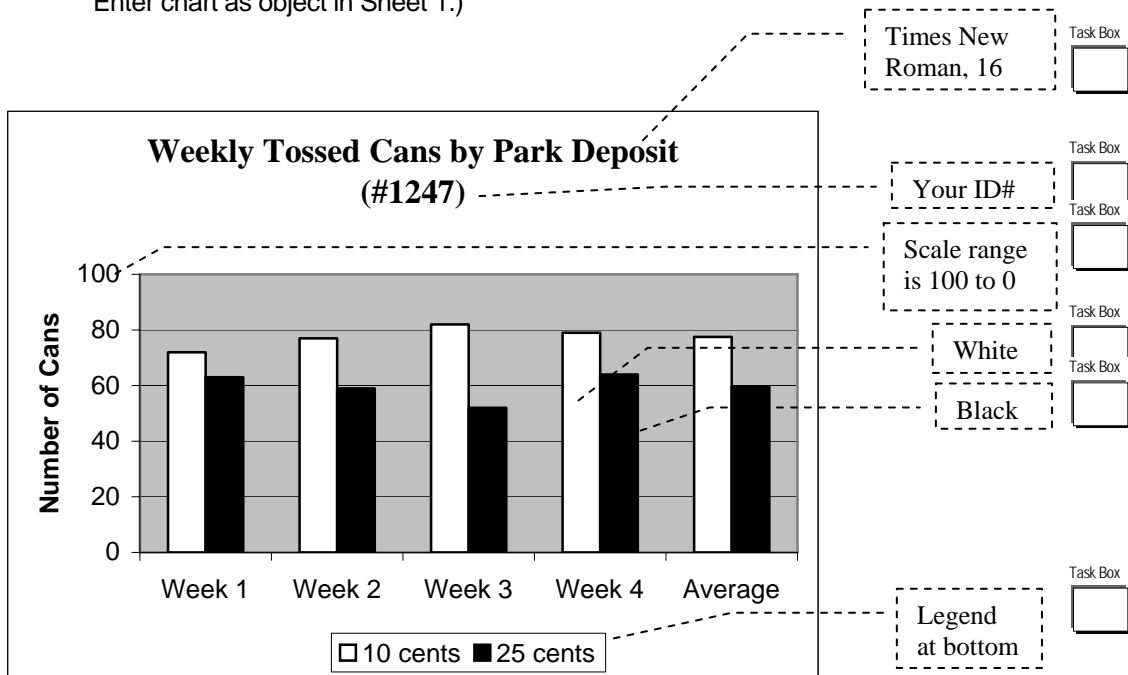
EXCEL TASK

Follow the instructions below to create an Excel spreadsheet and chart to show the number of soda cans in park trash bins by the deposit amount. Park 1 has a 10 cents per can deposit and Park 2 has a 25 cents deposit. Please check the task box as you complete each step.

1. **Create a Spreadsheet:** Please enter the information provided below into an Excel spreadsheet.

Week	10 cents	25 cents
Week 1	72	63
Week 2	77	59
Week 3	82	52
Week 4	79	64
Average		

2. **Use a Formula to Calculate Average:** After you have entered the data into the spreadsheet, enter or select an Excel formula that calculates the average number of cans in the park trash bins.
3. **Create a Chart:** Use the information to create a chart that is formatted exactly like the one below. Be sure to use the directions inside the boxes. (Note: Enter chart as object in Sheet 1.)



4. **Save work:** Save your work to the floppy disk in your envelope. Use the following format as the file name: ssyourID# (e.g. ss1247). Your ID# is on the front of your envelope.
5. **Print copy:** Print a copy of your work. Place the printout in your envelope.
6. **Leave Excel open:** Leave your Excel spreadsheet document open.

NEXT STEP ~

Complete the **PowerPoint Task** on the following page.

POWERPOINT TASK

Follow the instructions below to create a PowerPoint presentation with 3 slides.

Please check the task box as you complete each step.

Task Box

1. **Create 3 slides:** Use PowerPoint to create 3 slides with the following text and graphics. Be sure to use the directions inside the boxes.

SLIDE 1

Task Box

Task Box

Title – Reasons to Recycle
By [insert your ID number, e.g., 1247]

For the Title, use:
Times New Roman,
60 pt, Bold, Italicized

Graphic – [Select and insert a **relevant** clipart image on Slide 1.]

SLIDE 2

Task Box

Task Box

Title – Reasons to Recycle


Use a bulleted list for the reasons:
▪ Reason 1
▪ Reason 2

Task Box

Text – [Go to <http://idt.memphis.edu/recycle.htm> Copy and paste the *Reasons to Recycle*, word for word, as a **bulleted** list on Slide 2 (see example)]

Task Box

Graphic – [Go to <http://idt.memphis.edu/recycle.htm> and obtain the Recycling logo. Paste or insert image onto slide 2.]

The logo looks like this: 

SLIDE 3

Task Box

Task Box

Title – Recycling in Our Parks

Graphic – [Insert the spreadsheet chart you created in Excel.]

2. **Apply Design:** Apply a design template of your choice that supports the theme of the recycling presentation.
3. **Save Presentation:** Use the following filename to save your presentation to the floppy disk in your envelope: pptyourID# (e.g. ppt1247)
4. **Print Handout:** Print a handout of your presentation with **3 slides per page**.
5. **Place ALL materials in the envelope:** this sheet, your printed copy, and your floppy disk.
6. **If you finish early,** quietly read your book.

Task Box

Task Box

Task Box

Student Technology Skills Rubric

Student ID# _____

Assessed by: _____

SPREADSHEETS: When creating a Microsoft Excel spreadsheet, did the student		
1. enter numerical data into spreadsheet cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Numerical data are NOT entered into spreadsheet cells OR they are too inconsistent with Item 1 to be considered a valid representation of entered spreadsheet data.		Numerical data are entered into spreadsheet cells in a manner that precisely reflect the numbers / arrangement presented in Item 1.
2. place column names in correct cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words <i>Week, 10 cents,</i> and <i>20 cents</i> are NOT placed at the top of the spreadsheet columns OR they are too inconsistent with Item 1 to be considered a valid representation of column names.		The words <i>Week, 10 cents,</i> and <i>20 cents</i> are placed at the top of the three respective spreadsheet columns, as reflected in Item 1.
3. place row names in correct cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words <i>Week 1, Week 2, Week 3, Week 4,</i> and <i>Average</i> are NOT placed in correct cells OR they are too inconsistent with Item 1 to be considered a valid representation of row names.		The words <i>Week 1, Week 2, Week 3, Week 4,</i> and <i>Average</i> are placed at the left-hand side of each respective row of data, as reflected in Item 1.
4. use a spreadsheet formula to calculate the average of a column of numbers?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A spreadsheet formula is NOT used to correctly calculate the average of EITHER the 10-cent or 20 cent column.		A spreadsheet formula is used that correctly calculates the average of BOTH 10-cent (77.5) and 20 cent (59.5) columns.
5. create a chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A chart is NOT created OR the chart is too inconsistent with the spreadsheet data presented in Item 1 and the example chart presented in Item 3 to represent a valid chart.		A column chart is created that represents the spreadsheet data presented in Item 1 and exemplifies the sample chart in Item 3. Specifically, the chart is: a column chart, has 2 series, and has the correct / complete data selected.
6. change the color of columns in a column chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The colors of the columns in the column chart are NOT changed to Black and White.		One set of columns in the column chart is changed to white and another set is changed to black.
7. add a title to a chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A chart title is NOT present OR too inconsistent to be considered a valid chart title.		The title <i>Weekly Tossed Cans by Park Deposit (#####)</i> is present at the top of the created chart.
8. add a title to a chart axis?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A title is NOT present on the left-hand side (Y axis) of the chart OR it is too inconsistent to be considered a valid title for the chart axis.		The title <i>Number of Cans</i> is present on the left-hand side (Y-axis) of the chart.
9. change the range of the Y-axis scale?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The range of the Y axis scale on the chart is NOT changed to 0 to 100 OR it is too inconsistent to be considered a valid change.		The range of the Y axis scale on the chart title is changed to 0 to 100.
10. change the location of the legend?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The location of the legend is not changed to the bottom of the chart.		The location of the legend is changed to the bottom of the chart.

PRESENTATION: When creating a Microsoft PowerPoint presentation, did the student . . .		
1. add text to a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words <i>Reasons to Recycle or Recycling in our Parks</i> is NOT present on slide 1, 2 or 3.		The words <i>Reasons to Recycle or Recycling in our Parks</i> is present on slide 1, 2 or 3.
2. add a slide to a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Only one slide is present in the presentation.		More than one slide is present in the presentation.
3. insert a clipart image or photograph to a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A clipart image or photograph is NOT present on slide 1.		A clipart image or photograph is present on slide 1.
4. change the font of text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 <i>Reasons to Recycle</i> is NOT changed to Times New Roman.		The title of slide 1 <i>Reasons to Recycle</i> is changed to Times New Roman.
5. change the size of text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 is NOT changed to 60pt.		The title of slide 1 is changed to 60pt.
6. bold text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 is NOT bold.		The title of slide 1 is bold.
7. insert a Microsoft Excel spreadsheet chart onto a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The user-created Excel chart is NOT inserted on slide 3.		The user-created Excel chart is inserted on slide 3.
8. arrange content on slide as a bullet list		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Reasons to Recycle are NOT present on slide 2 as a bulleted list		Reasons to Recycle are present on slide 2 as a bulleted list
9. add a design template to a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A design template is NOT added to the presentation.		A design template is added to the presentation.
10. select and use relevant images?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The image(s) selected and used on slide 1 are NOT relevant to the presentation.		The image(s) selected and used on slide 1 are relevant to the presentation.
INTERNET: Regarding the Internet, did the student . . .		
1. navigate to a website when given a specific web address (URL)?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The Reasons to Recycle and/or recycling logo are NOT present on slide 2.		The Reasons to Recycle and/or recycling logo are present on slide 2.
2. obtain an image from a website and use it in a document?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The recycling logo is NOT used in the presentation.		The recycling logo is used in the presentation.